Vol. XXIV MARCH 1930 No. 3

The EXCAVATING ENGINEER

IN THIS ISSUE:

Damming the Sacandaga.

Modern Machines Increase Production in Quarries of "Happy Valley".

Boulder Dam.

Echoes of the January Equipment Shows.

Front Cover Illustration: Excavating for Conklingville Dam, one of sixteen Hudson River regulation projects.

THE SHORT CUT TO PROFITS

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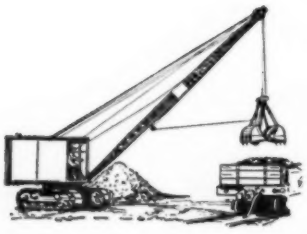

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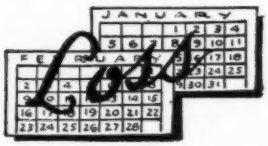

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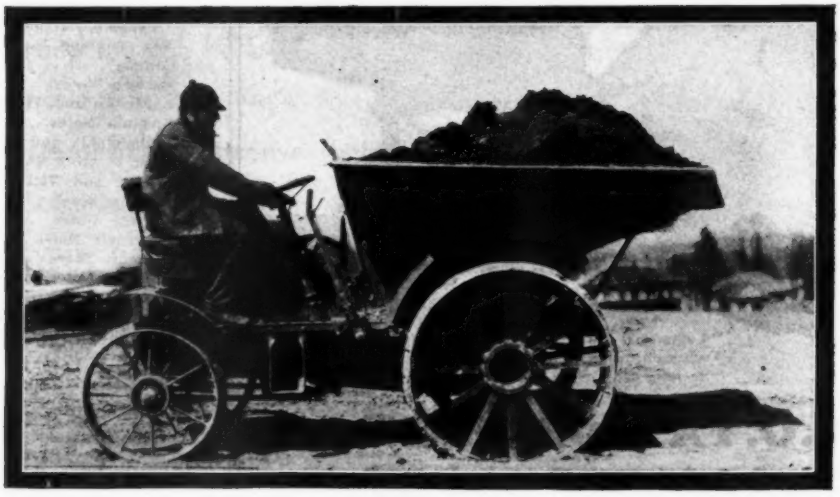

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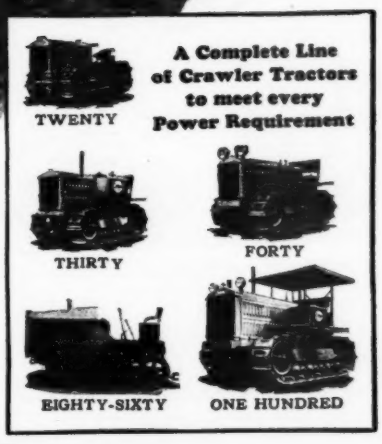

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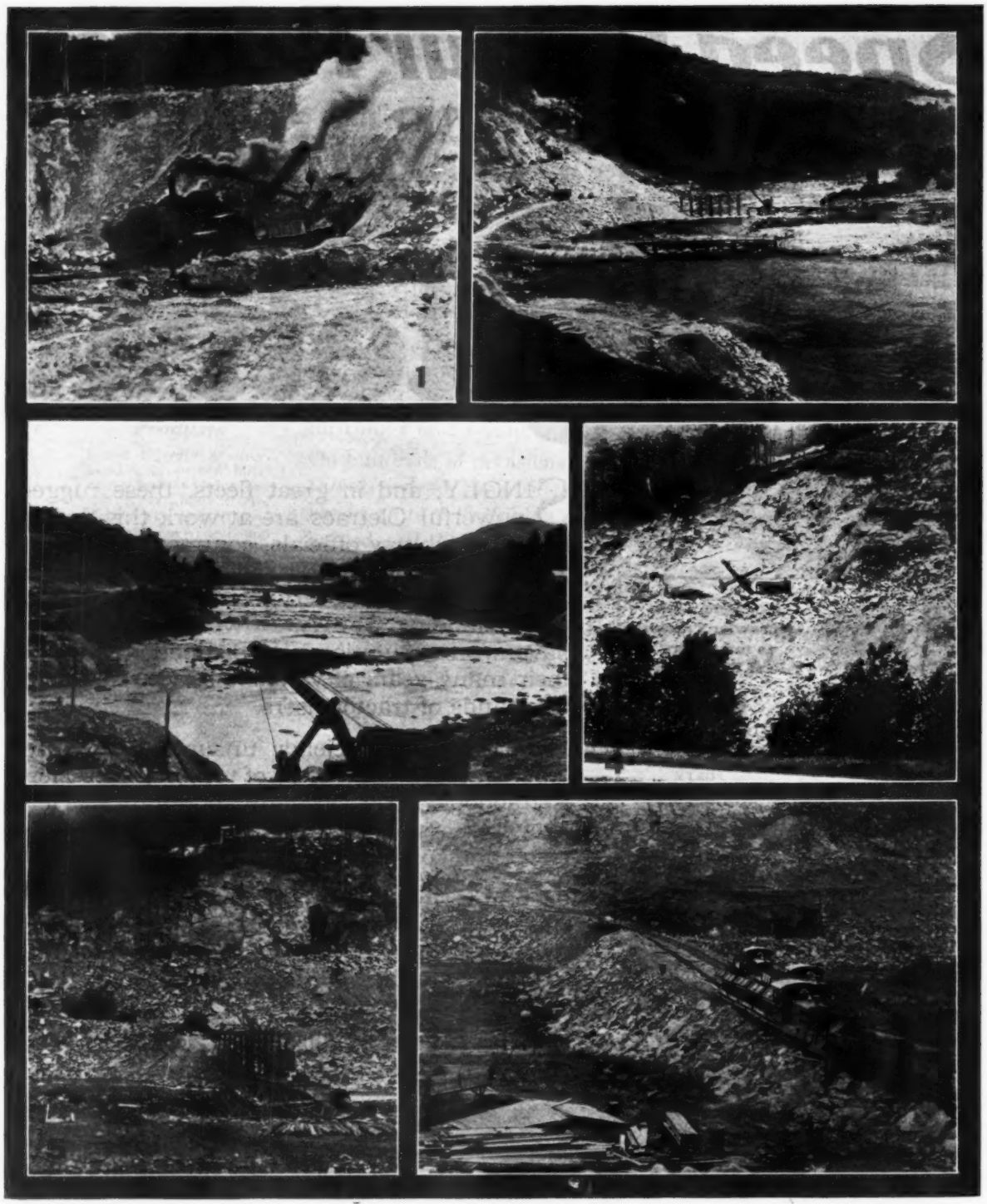

Starting the Dam

1. Excavating for the start of the diversion channel with Bucyrus-Erie Type B-2 steam shovel.
2. Truck hauling from the side hill cut.
3. Safe on the downstream side, but the old town of Conklingville and several other small valley towns will be wiped out entirely by the 44,000-acre huge artificial lake behind the dam.
4. In this side hill there was 225,000 cubic yards of hard rock excavation.
5. Setting up drump trestle with Bucyrus-Erie B-2 crane, with Bucyrus-Erie 50-B Diesel and 50-B steamers in rock cuts on the north hill side.
6. Plymouths and Westerns taking time off for lunch.

The EXCAVATING ENGINEER

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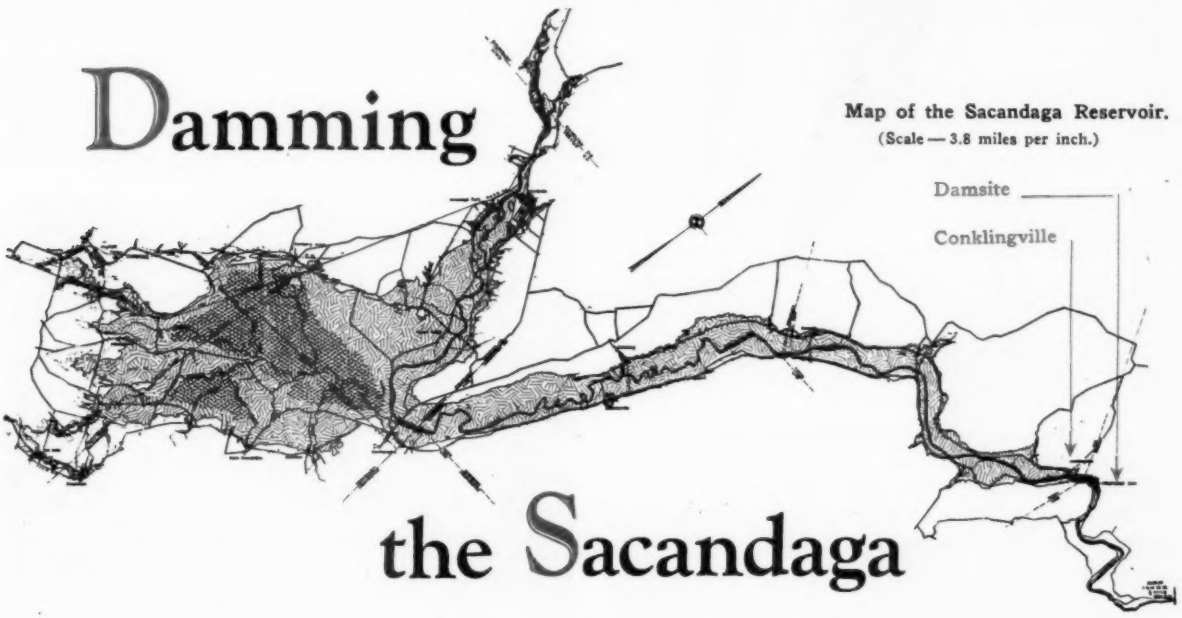
Damming the Sacandaga



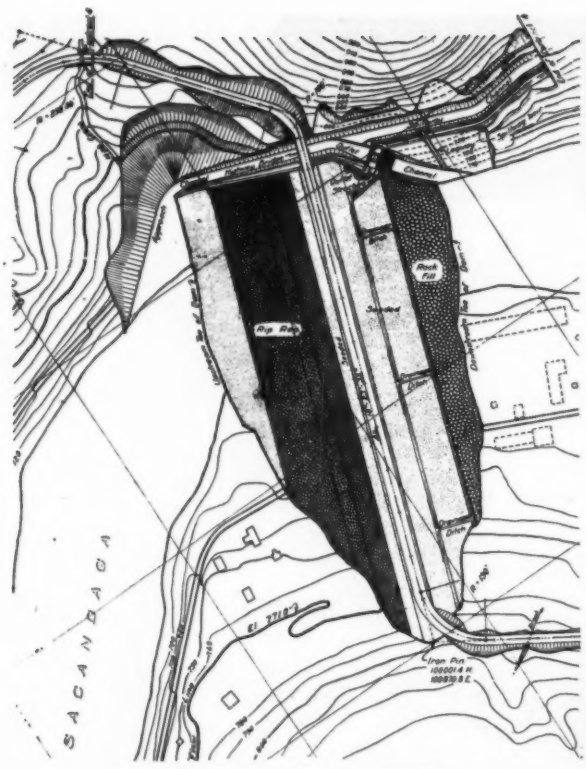
S. J. Groves & Sons Company builds first of sixteen dams to regulate the flow of the Hudson River.

By C. C. CHAMBERS, *Resident Engineer*

IN the southern part of the Adirondack Mountains of northeastern New York a storage reservoir, with a capacity of thirty-seven billion cubic feet, is being created by the building of an earth-fill dam across the Sacandaga River about six miles above the point where it joins the Hudson River at Hadley, New York. The dam, now nearing completion, is at the village of Conklingville, from which it derives its name.

This dam, being built by S. J. Groves & Sons Company, well-known general contractors of Minneapolis, Minnesota, is part of a great project planned by the Board of Hudson River Regulating District, which is being carried out under Edward H. Sargent, Chief Engineer. In all sixteen dams will be built to regulate the flow of water into the Hudson River, which at certain times of the year is extremely high, particularly around Troy and Albany, New York. It is to eliminate this feature and secure a more even flow of water the year round that these dams are contemplated. Two main benefits will result from this regulation: lowering this peak flow of the river for flood control, and increasing the low water flow to provide continuous water power in the Hudson between Hadley and Troy.

The two main divisions of the Conklingville Dam are the earth-fill embankment, 1100 feet long and 100 feet high, which is built by the modified hydraulic fill method, and the permanent river diversion channel which has been carved out of the ledge-rock hillside at the north end of the dam and in which the outlet control works are built. And along the side of this channel a concrete overflow spillway is provided below the dam. This side channel spillway is 400 feet long, and at its down-



General layout of Conklingville Dam.

stream end is a forebay and powerhouse. About 20,000 cubic yards of concrete are required for the outlet structure, spillway, retaining walls, channel lining, etc.

Actual Construction Begun March 1928

The preliminary work of camp construction, installation of equipment and clearing the site was done during the winter of 1927 and 1928, and actual construction began in March 1928. Equipment and supplies were brought to the job from Hadley over six miles of fairly good gravel-surfaced roads. All power shovels came in with their own power and forded the river when necessary. The other equipment, including 20-ton locomotives, was hauled by trucks or carried on heavy-duty trailers.

In general, the rate of construction progress on the major items of work has depended upon the ability to solve excavation problems. The building of the concrete structures and the power house must wait until the excavating forces had prepared the foundations. The hydraulic fill could not be started until the river flow had been diverted into its new channel, and until excavation work had prepared the foundation upon which the earth fill would be built. And the progress on the main embankment itself was in large part controlled by the speed at which the material could be excavated and transported to the dam.

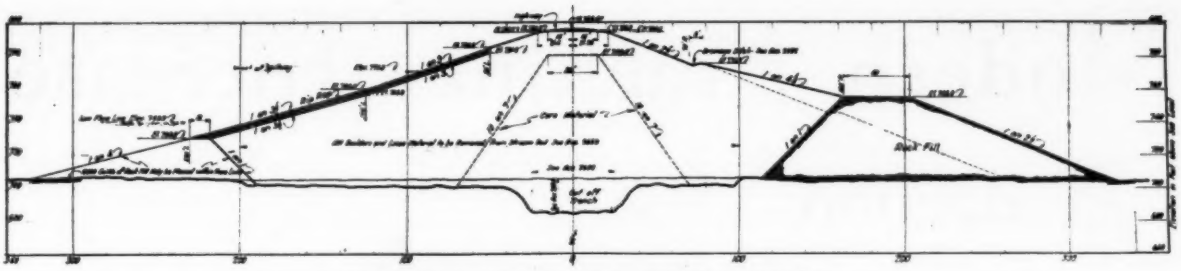
20-foot Channel — 50 Feet Deep Through Ledge Rock

About 225,000 cubic yards of ledge rock excavation and 100,000 cubic yards of earth overburden

The "eternal" hills are no match for the contractor of today and his modern tools. General Superintendent Lease at left. Note men with jackhammers beside the track and out on the rocks half way up at the extreme right.

were taken out of the hillside at the north end of the dam to form the channel and structure sites mentioned above. This work was confined to a section about 1,500 feet long. Through the deepest part, the top of the cut is about 200 feet in elevation above the bottom of the finished channel. The top 150 feet is side-hill cut, and the bottom 50 feet

General view of operations — diversion channel at left, borrow pit at right. Note classification of material in the fill.



Typical cross section, showing type of construction.

of the cut is a channel through the ledge rock with steep sides and a bottom width of only 20 feet. A part of the material from the rock excavation was salvaged to build a 145,000-cubic-yard loose rock fill at the downstream toe of the dam. The surplus material has been wasted in spoil banks above and below the dam.

The natural ledge rock is a gneiss formation similar to a granite, structurally hard but fractured by seams; one set of seams are parallel planes, almost vertical, and in approximately the same direction as the diversion channel, another set of seams are in planes tipped 55 degrees from horizontal. The north side of the open channel was designed to conform somewhat to this 55-degree slope. The rock is further fractured by many miscellaneous cross seams.

"Coyote" holes 30 feet deep carried charges of 500 to 700 pounds of black powder.

The excavation was made with three Bucyrus-Erie 50-B shovels, two with steam power and the other Diesel-driven. Two smaller Bucyrus-Erie shovels opened up the excavation with pilot cuts and made the narrow channel at the bottom of the cut. More than half of the material was hauled to dumps in trucks, and the remainder with trains. Linn caterpillar-mounted trucks were used on the steeper grades and over soft roads, and two to five-ton International and Mack trucks wherever road conditions would permit. The train equipment was 36-inch gauge, four-yard dump cars and twenty-ton Plymouth gasoline locomotives.

The first shovel cut was opened up in the hillside at an elevation about 90 feet above the bottom of the channel. The 50,000 cubic yards of material above the cut was brought down by blasting explosives placed in "coyote" holes and jackhammer drill holes. After a pilot cut had been made along the hillside, the "coyote" holes, spaced 36 feet apart were driven about 30 feet horizontally into the side of the cut to within two feet of the slope line for the finished cut, where side galleries were driven twelve feet in each direction. This provided pockets for blasting charges at twelve-foot intervals, and in each pocket was placed from 500 to 700 pounds of black powder. Considerable jackhammer drilling was required to bring down the top of the slope after the "coyote" blasts were made. This method was only used in a 200-foot section of the top cut, material in other parts of this cut was brought down in smaller quantities with jackhammer drilling.

From the bottom of the first cut down to the point where the excavation changed from side hill to channel cut, the material was loosened by charges placed in well drill holes spaced about 20

Note the peculiar rock formation as shown in this June 2, 1928, progress view of excavation of the spillway channel east of Station 9 and above Elevation 795. Two-truck spotting kept the 50-B steamer on her toes.

feet apart and from 20 to 30 feet deep. To avoid overbreaking the sides and concrete foundations, the drilling within the channel cut was limited to 10-foot holes put down with jackhammer and tripod drills. The center part of the channel to

(Continued on Page 161.)

Modern Machines Increase Production in Quarries of "Happy Valley"

2-yard electric shovels installed to increase production of limestone quarry. Modernizing of hauling system will follow. Note mat of brush used to protect roof of lower machine from falling rock fragments.

Enterprising French Company mechanize famous marble and limestone quarries.

TO travellers from London to Paris by the well-known Dover-Calais route, the big limestone and marble quarries between Calais and Boulogne are a familiar sight.

On leaving Calais, the train climbs its way to the top of a high hill overlooking the sea, and then rushes down into Boulogne. At the top of this hill, the quarries of the big French Company, Societe des Carrieres de la Vallee Heureuse & du Hout-Banc, are situated; and the main railway line passes along the edge of two of their workings.

The "Happy Valley" (Vallee Heureuse) is one of the biggest rock quarrying concerns in France, and certainly the most important in the Northern territory. Being situated on the main line, they are well placed for marketing their crushed rock and cut marble blocks for which these quarries are famous.

The Company was formed in 1905, as a result of an amalgamation between two quarrying concerns in the district, and, since the merger, no effort or expense has been spared to make this one of the most progressive quarrying installations in Europe.

Working Face Totals 6,500 Feet

The total length of working face of the three main excavations amounts to about 6,500 feet, while the quarrying face at the deepest places is about 130 feet.

One of the quarries is worked solely for the extraction of marble blocks; and the method used for cutting these blocks is by steel wires, of which a total length amounting to about fifteen miles is used in the quarry.

An unusual feature in this pit is the installation of the immense overhead travelling crane, shown in the accompanying illustration, for lifting the blocks after they have been cut out from the solid rock, and placing them in stock or on to cars. This travelling crane itself weighs about 600 tons, and is capable of lifting blocks up to 75 tons apiece. The length of the runway is nearly 300 feet, and the height about 120 feet. This remark-

"Happy Valley" from an airplane. Left, the quarries; center, employees' war memorial slightly above center where walks form a cross; right, workmen's quarters — note gardens and how a whole street of houses is built as one unit.

able crane was built by the well-known French manufacturers, Schneider, and was installed in the quarry in 1925.

Marble Used in Many Famous European Buildings

The marble product of this quarry is marketed to all the principal countries in Europe. The Company recently built their own office from their own beautiful marble, and, as is shown by the accompanying photograph, they produced a very fine building. The new Hotel de Ville of the town of Calais, shown in the same group picture, was also built of stone supplied by the Vallee Heureuse Company.

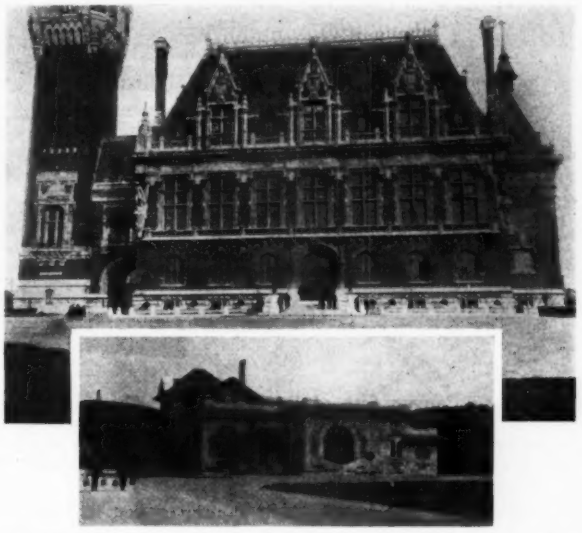
The other two quarries are used only for the production of crushed rock for industrial purposes; which is marketed for building purposes, harbor construction, ballasting of railroads and highways, blast furnace flux and cement manufacture, and so forth.

Hand Labor Loading Replaced by Most Modern Power Shovels

Until 1929 these other quarries were worked entirely by hand labor; but, with a view to modernization and increased production, the Company installed in July, 1929, two Bucyrus-Erie 2-cubic-yard Ward-Leonard electric shovels. These two machines are at present loading the rock, but the transport system has not yet been brought into line. Consequently, the shovels are using the old 1-cubic-yard cars on narrow gauge which were previously employed for hand labor. On this account it has been necessary to install the timber hoppers for feeding the cars, as shown in the accompanying photographs.

75-ton capacity travelling crane in marble quarry.

In the near future this obsolete transport system



Built of Vallee Heureuse Marble. Above: "Hotel de Ville de Calais" which, in Yankee, would probably be translated as "City Hall at Caley." Below: Quarry office at "Happy Valley."

will be done away with entirely and replaced by large capacity rail cars.

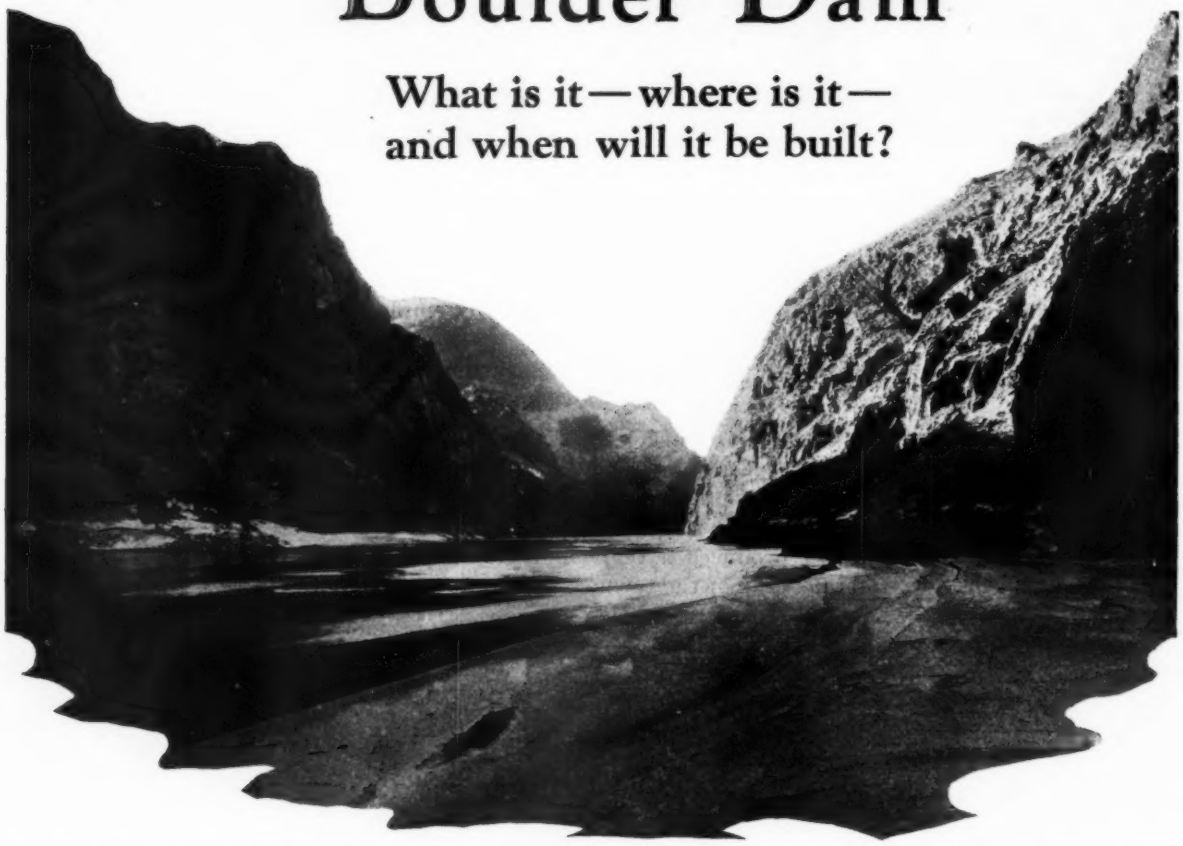
These two Bucyrus-Erie 50-B electric shovels were very quickly erected and put to work upon their arrival; and the owners were pleased to find how quickly their operators were able to handle the shovels efficiently on account of the simplicity and ease of operation of the Ward-Leonard control. Since the date of their installation they have operated day and night without a single stop. The rock is shot down by heavy, well-drilled blasts, "Keystones" being used for the drilling.

Efficient workshops where all normal repair work can be carried out form part of the quarry installation and are conveniently located.

(Continued on Page 137.)

Boulder Dam

What is it—where is it—and when will it be built?



The Black Canyon Site of Boulder Dam. The mighty waters of the Colorado glide through the granite hills on their way to the Gulf of California. The stream here has a speed of about twenty miles per hour. In the spring it is perhaps twice that, and the raging waters cover the sand flats and battle against the sheer walls of the gorge. Here Boulder Dam will create a deep narrow lake 100 miles long — a reservoir with a capacity of 26,000,000 to 30,000,000 acre feet.

So many questions have come to us regarding Boulder Dam that we attempt to give here a summary of facts regarding the present status of this great project.

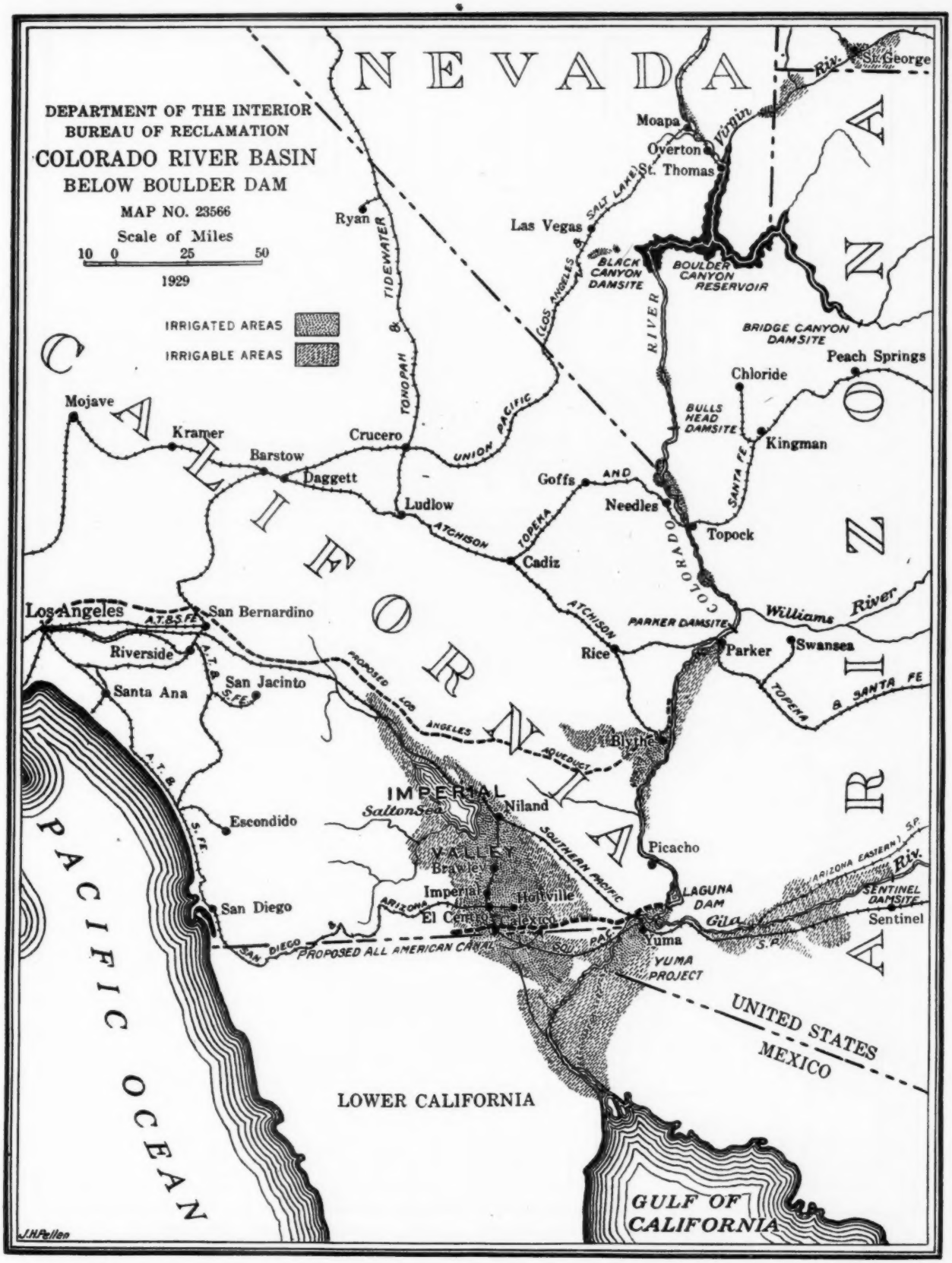
On December 21, 1928, the President approved the Boulder Canyon Project Act, authorizing the construction by the Secretary of the Interior of the Boulder Dam and incidental work on the Colorado River. A portion of the general public seemed to understand this fact to imply that the actual work of construction would begin at once. This impression is in error, however, as the Boulder Dam Project does not release any funds for the work, but provides that, before any such appropriations are made, contracts for the disposal of the 1,000,000 horse power hydro-electric energy to be developed at the dam must be secured sufficient in the judgment of the Secretary of the Interior to meet operation and maintenance expense, and to insure repayment to the government within 50 years of the construction cost plus interest of four per cent per annum.

Applications totaling much more than the capacity of the power plant have been submitted, and the allocation of power is now under consideration by Secretary of Interior Wilbur. It is expected that a satisfactory and fair apportionment of power will be made soon, and the further necessary formalities will follow without undue delay. — *Editor.*

▲ ▲ ▲ ▲ ▲

By MARSHALL BREEDEN

THERE have been many earthquakes in the Black Canyon Region. It is a rugged, hard, unbending land of mountains, rocks, sage, greasewood, coyotes, and bitter winds. Now under authority of Congress, man is to build a gigantic obstacle in the bed of the turbulent Colorado River. A dam is to be constructed, power houses to be built, tunnels driven, irrigation canals miles in extent prepared, and all of this work is to be in the waste lands, where at this time there is not



Location of Boulder Dam, Reservoir, location of All-American Canal and areas to be irrigated by the Boulder Project are shown in the above map.

The Act which makes Boulder Dam possible is summarized in the chart above.

BOULDER CANYON PROJECT ACT

PUBLIC No. 642, 70th CONGRESS
APPROVED DECEMBER 21, 1928

PURPOSES

1. CONTROL OF FLOODS
2. IMPROVEMENT OF NAVIGATION
3. REGULATION OF FLOW
4. IRRIGATION DEVELOPMENT
5. DOMESTIC WATER SUPPLY
6. GENERATION OF POWER

CONDITIONS

1.- Not effective until the Colorado River Compact has been ratified by the 7 basin States or after 6 months by California and 5 others. *Sec. 4 (a)*
2.- Not effective until California agrees to limit her annual consumptive use of Colorado River water to 4,400,000 acre feet plus one-half of any surplus waters unapportioned by the Colorado River Compact. *Sec. 4 (a)*
3.- No appropriation is to be made for construction until the Secretary of the Interior shall provide by contract for revenues adequate to pay operation and maintenance expenses and meet repayment requirements. *Sec. 4(b)*
4.- All operations are to be subject to the Colorado River Compact. *Sec. 8*
5.- The Act shall be deemed a supplement to the Reclamation Law. *Sec. 14*

BOULDER CANYON PROJECT

Authorizes the Secretary of the Interior to construct the Boulder Canyon Project. *Section 1*

BOULDER DAM

PURPOSES
1. River regulation, improvement of navigation and flood control.
2. Irrigation and domestic water supply.
3. Power *Section 6*

Location:
Boulder or Black Canyon.
Capacity:
Not less than 20,000,000 acre feet. *Section 1*

Irrigable public lands shall be withdrawn to be opened to entry under Reclamation Law, with preference to ex-soldiers, sailors and marines. *Section 9*

Title to works shall forever remain in the United States. *Section 6*

ALL-AMERICAN CANAL

To connect Laguna or another suitable diversion dam with Imperial and Coachella Valleys. *Sec. 1*

Cost to be reimbursable in accordance with terms of the Reclamation Law. *Section 4 (h)*

Title with certain exceptions may be transferred to districts or other agencies after all repayments are made. *Section 7*

No charge shall be made for water for irrigation or potable purposes in Imperial and Coachella Valleys. *Section 1*

Districts may utilize power possibilities on the canal and be credited with net proceeds. *Section 7*

POWER DEVELOPMENT

ALTERNATIVES
The Secretary of the Interior (a) may build a plant *Sec 1* and deliver energy at the switchboard *Section 5* (b) lease one or more units of the Gov't built plant *Sec 6* (c) lease water for generation of power in plants to be built by lessees. *Sec 6*

Rules and regulations shall conform to requirements and policies of the Federal Water Power Act. *Section 6*

Rates shall assure reasonable returns and may be readjusted periodically as justified by competitive conditions. *Section 5 (a)*

COLORADO RIVER DAM FUND

Establishes the Colorado River Dam Fund for carrying out the provisions of the Act. *Section 2*

REVENUES

All revenues shall be paid into the Colorado River Dam Fund. *Section 2 (a)*

Balance available for repayment shall be determined at close of each fiscal year and covered into the U. S. Treasury. *Section 2(e)*

EXCESS REVENUES

Revenues in excess of amortization requirements to be allotted —
62½ % to flood control repayment. *Section 2 (b)*
18¾ % to State of Arizona *Section 4 (b)*
18¾ % to State of Nevada *Section 4 (b)*

After repayment to U. S. of all money advanced, with interest, revenues shall be kept in separate fund and expended within the Colorado River Basin as prescribed by Congress. *Sec. 5*

APPROPRIATIONS

Appropriations not to exceed $165,000,000 in the aggregate are authorized. *Section 2 (b)*

Amounts deemed necessary by Secretary of the Interior shall be advanced to the Fund by Secretary of the Treasury, within appropriation limits. Interest to be charged annually at 4% on amounts advanced. *Section 2(b)*

Operation and maintenance expenses to be paid only from appropriations therefor. *Section 2 (c)*

REPAYMENTS

All amounts advanced for operation and maintenance and for construction of the dam and power plant to be repaid with interest within 50 years. *Section 4 (b)*

Expenditures on All-American Canal, including O. and M. to be repaid in manner provided in the Reclamation Law *Sec. 4*

FLOOD CONTROL

$25,000,000 is allocated to flood control and is to be repaid from revenues in excess of amortization requirements *Section 2(b)*

CONTRACTS

No contract shall be for longer duration than 50 years, with right of renewal at expiration under then existing laws and regulations. *Section 5 (a) and (b)*

Conflicting applications for contracts to be resolved in conformity with policy of Federal Water Power Act, except that preference shall be given to a State for energy for use in the State. *Section 5 (c)*

Any contractor for 100,000 h. p. or more may be required to permit any contractor for less than 25,000 h. p. to share his transmission lines. *Section 5 (d)*

COLORADO RIVER COMPACT

Ratifies the Colorado River Compact and makes other provisions. *Section 13*

INVESTIGATIONS

Authorizes the appropriation of $250,000 for investigations to formulate a comprehensive plan for the utilization of Colorado River *Section 15*

Authorizes investigations of the Parker-Gila Valley reclamation project. *Sec. 11*

WATER RIGHTS

All rights of the U. S. and its grantees to waters of the Colorado River shall be subject to the Colorado River Compact. *Section 13 (b)*

Nothing in the Act shall be construed as a denial or recognition of any rights in Mexico to the use of waters of the Colorado River. *Section 20*

INTERSTATE COMPACTS

Ratifies Colorado River Compact on behalf of the U. S., 6 or 7 State basis. *Section 13(a)*

Authorizes negotiation of interstate compacts supplemental to the Colorado River Compact. *Section 19*

Authorizes tri-state compact between Arizona, California and Nevada. *Section 4 (a)*

POWER LICENSES

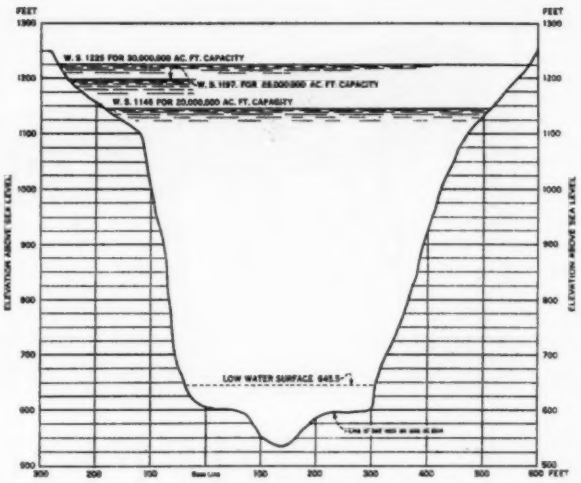
Federal Power Commission is not to issue licenses except on Gila River until the Act becomes effective *Sec. 6*

DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION

SYNOPSIS OF
BOULDER CANYON PROJECT ACT

a house or a building. The Colorado is wide and deep and swift as it rushes through the Grand Canyon on its way to Black Canyon and beyond to the Gulf of California. As yet hardly a boat is to be found moored along its twisting banks, or dotting its surface. Snakes slide along the shores, jack rabbits drink in the eddies, carrion birds circle high over head and lizards bask in the torrid summer sun. To this place, then, man will bring tools, machinery, food, materials, and here in the outlands man will build Boulder Dam, largest in the world.

It is true that in former geologic times this district was subjected repeatedly to volcanism and deformation. Every rock, every rugged promontory says so, every mile of devilish surface shouts its origin. These events must have been accompanied by terrific earthquakes. But such evidence as there is, both to be observed in the field and to be gathered from records, indicates that these geological activities ceased long ago, and that the region has been virtually undisturbed for a very long time. Grass has grown for centuries near the banks of the river, desert trees have risen, flourished and died, and the earth has not been disturbed. So science says the district has comparative freedom from present-day earth movements. The danger from local earthquakes of enough violence to threaten a properly constructed dam in Black Canyon, therefore, is negligible.

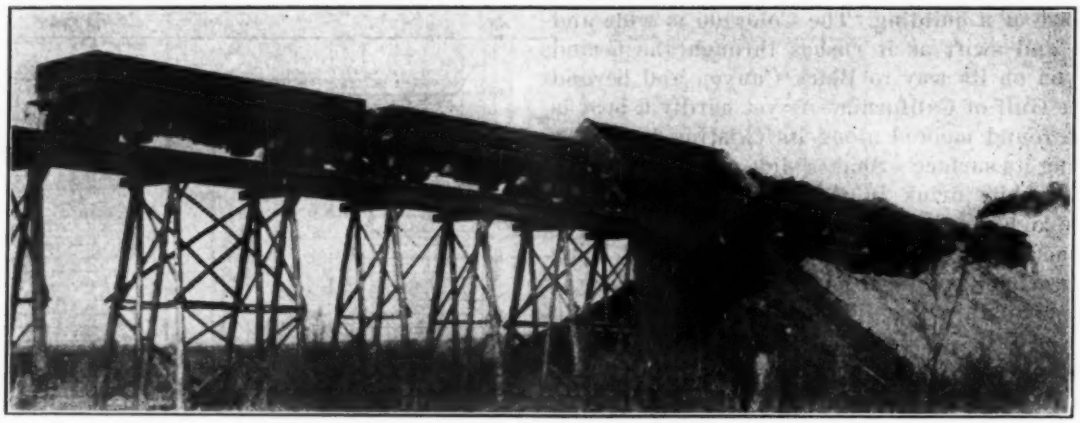


Profile of dam site in Black Canyon (looking downstream).

Even if nature abandoned her violence centuries ago, it required much political effort to prepare the way for the proposed Boulder Dam construction. Little stuff, the political views of men when compared to the titanic uprisings of nature, uprisings which culminated in making the one spot in all the world suitable for such an undertaking. For there are no other Black Canyon dam sites known to the engineers of the world. This is the only one.

(Continued on Page 154.)

On the road to the Boulder Dam site. The scenery is marvelous. The terrain is rugged, the color grey, slashed with crimson, the growth sage and greasewood. A fit place for strong young men. Between Las Vegas and Black Canyon.



DIFFERENTIAL

Double Trunnion

AIR DUMP CARS

All Steel—Long Life—Low Maintenance—Floors and Doors Constructed to Withstand the Severest Service.

OPERATING CHARACTERISTICS

AIR OPERATION. Operation of a small valve handle is all that is necessary to dump a car. Cars dump to either side and may be arranged so that an entire train may be dumped from the locomotive or any one car in the train.

LOW HEIGHT. The double trunnion principle allows the body to be carried over the bolster side bearings at a considerable reduction in the height of the car. This low height is a considerable advantage in loading.

SAFETY. The car cannot dump accidentally. There is no locking mechanism to fail and cause accidental dumping. There is no chance for accidental dumping due to leaky valves.

DOOR OPERATION. Door automatically folds down during the dumping operation and closes itself when the body returns to central position.

STABILITY. The stability of the Differential Car prevents derailments, spilling of the load in transit, and promotes safety.

DUMPING ACTION. Dumping is quick and sure, yet there is no shock at the end of the dumping stroke to damage track structure, trestles, or the car itself.

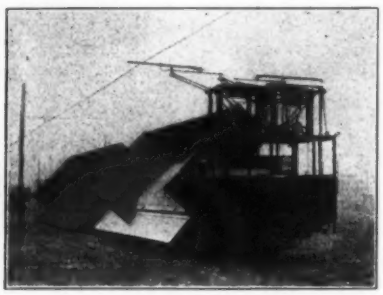
CASTING THE LOAD. The combination of the double trunnion principle and down-folding door casts the load well away from track.

Casts Load Away from Track

There is a Differential Car built for nearly every operating condition. Write for information.

The Differential Steel Car Co.

Findlay, - - - Ohio



Complete Haulage Systems Designed and Built.

Electric Locomotives — Diesel and Gasoline Locomotives.

Operating figures and cost data on Differential Systems furnished and applied to your problems.

In writing to The Differential Steel Car Co. please use post card bound in the center of this number.

FIELD NOTES

Which—"Asphaltic" or "Paraffin" Base Oil for Truck Engines?

"Which is the more satisfactory oil for the lubrication of internal combustion engines—one of asphaltic base origin or one of paraffin or mixed base origin?" is a question that I am often asked both by operators of fleets of trucks and by the individual owner of a single truck.

Basing my conclusions on the results of personal observations and experiences, I am of the opinion that the *proper grade* of either will prove entirely satisfactory for the lubrication of a particular type of truck engine. By "satisfactory" is meant an oil that will maintain the requisite lubricating film with the consumption of the smallest possible amount of oil. However, because of the inherent characteristics of the two types of oils, the physical tests (particularly, the viscosity) on the grade of oil deemed most suitable for the particular purpose of lubrication will vary.

In corroboration of this personal opinion, the results of a series of practical experiments made by Thomas E. Sutton, Assistant State Highway Engineer of California, become of interest. Comparisons were made between California mixed-base, California asphalt and Eastern paraffin-base oils. One well-known brand of each type of oil was used in two trucks. All trucks were virtually new and had the same makes of engines, magnetos and carburetors.

Table 1 shows the results of these practical tests:

TABLE 1

Results of Tests on Various Types of Lubricating Oils

Oil Used	Truck No.	Total Carbon Grams	Miles per Quart Oil	Miles per Gallon Gasoline
Eastern Paraffin Base..	814	108	32.88	7.15
	810	95	99.81	6.65
Average		101	66.35	6.90
California Mixed Base.	811	86	88.49	7.41
	799	88	69.23	7.04
	806	74	107.53	6.73
	819	105	58.49	6.85
Average		88	80.93	7.01
California Asphalt Base	806	52	116.87	6.36
	819	57	71.33	6.67
	801	96	54.83	7.35
	799	89	37.37	8.11
Average		73	70.10	7.12

Table 2 shows the results of a second test made on California mixed-base oils, in which test two loaded trucks were sent over a 331.5-mile trip. This trip was over mountains and sandy country, the trucks being run part of the time in second and third gear. Water in the radiators of both trucks was boiling three-fourths of the time during the first three days of the trip.

TABLE 2

Results of Comparative Road Tests Made on California Asphaltic and Mixed Base Lubricating Oils

Truck No.	Gross Weights	Miles Traveled	Oil Used Qts.	Gas Gals.	Carbon Grams	Temp. of Oil Low	Temp. of Oil High
		California Asphalt Base					
814	14,519 lbs.	331.5	14.5	98	65	60°	180°
		California Mixed Base					
819	14,525 lbs.	331.5	14.0	97	78	60°	190°

Following are the conclusions of Mr. Sutton upon completing his tests:

> The net result of all three *tests did not indicate any appreciable superiority in either grade of oil over the other.*
>
> Although thinning out more rapidly, the asphaltic base oil did not show any greater breaking down under high working temperatures than the paraffin base oil, nor was there a greater deposit of carbon. Neither did the viscosity after use increase or decrease any more in the case of one than the other.
>
> Where one grade of oil is used all seasons of the year and under a wide range of temperature there appears to be some practical advantages in the use of the paraffin base oil, as for normal temperatures above 40 degrees this oil is less stiff and therefore it is easier to start the motor in cold weather than with an asphaltic base oil of the same viscosity at working temperatures.
>
> There appears to be no reason, however, why a lighter grade of asphaltic base oil can not be used in cold weather than in hot weather, and why, if a proper selection is made based on weather and working conditions, there should be any practical difficulties with this grade of oil.

Martin J. Gavin and Gustav Wade in "Engine Service Tests of Internal Combustion Engine Lubricating Oils Made from California Crude Petroleum" (Bureau of Mines Technical Paper 387) state:

> "A lubricating oil for an internal combustion engine can be considered as giving good service if (a) it lubricates effectively, (b) with its use there is minimum danger of lubrication failure and (c) its consumption is not excessive."

And then these same investigators add:

> "All of the oils (California asphaltic base) used in these tests seem to lubricate effectively."

By H. L. KAUFFMAN, *Petroleum Consultant.*

Eyes Right?

Biddie: "I suppose you have been in the navy so long you are accustomed to sea legs?"

Middie: "Lady, I wasn't even looking."

When a modern wife feels real domestic she takes her husband to a restaurant advertising home cooking.

A motorist is a man who thinks his make of automobile is the best in the world, but is saving up his money to buy another kind next year.

Roebling

"Blue Center" Steel Wire Rope

The Rope That Lasts

John A. Roebling's Sons Company
Trenton, New Jersey

In writing to John A. Roebling's Sons Co. please use post card bound in the center of this number.

Echoes of the January Equipment Shows

General view of the five million dollars worth of equipment displayed in the Atlantic City Auditorium.

The various January conventions and shows were covered quite fully in our February issue but we have the pleasure of presenting to you this month some interesting pictures from the Road Show and National Crushed Stone exhibit. Among Excavating Engineer advertisers who were represented in this gigantic exhibition of road-building machinery shown to road builders from all parts of the United States and from many foreign countries at Atlantic City were: Allis-Chalmers Mfg. Co., American Steel & Wire Co., Athey Truss Wheel Co., Atlas-Imperial Diesel Engine Co., Blaw-Knox Co., The Buckeye Traction Ditcher Co., Bucyrus-Erie Co., Caterpillar Tractor Co., The Cleveland Tractor Co., Erie Steel Construction Co., George Haiss Mfg. Co., Inc., The Hayward Co., The Hug Company, The Hughes-Keenan Co., A. Leschen & Sons Rope Co., The Owen Bucket Co., The Timken Roller Bearing Co., Western Wheeled Scraper Co., Wisconsin Motor Co., Nordberg Manufacturing Co., G. H. Williams Co., Williamsport Wire Rope Company.

On the boardwalk during the Road Show. Left to right: Senor Santiago Aramayo, Bolivian delegate; Senor Dominico Romano, Engineer, Ministry of Public Works, Italy, Italian delegate; Senora Aramayo; H. H. Braun, Foreign and Export, Bucyrus-Erie Company; Senora Romano and Senorita Aramayo.

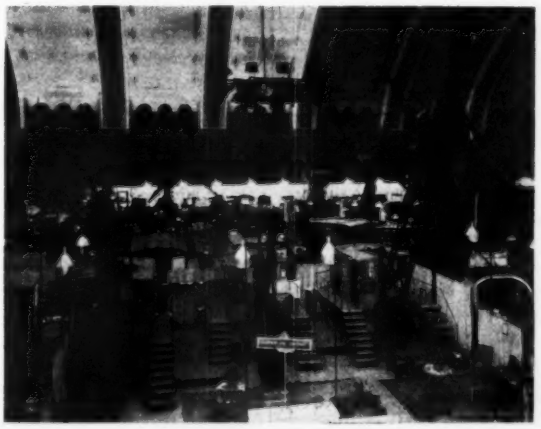


Exhibit of the Bucyrus-Erie Company at the Road Show, consisting of Gas + Air (1-yard) Type 1030 (¾-yard) and Type 1020 (½-yard) machines.

At this time the choice of a location for the 1931 show seems to lean strongly toward the South, Houston and New Orleans being considered as the strongest contenders.

One exhibit at the National Crushed Stone Association Convention which attracted a great deal of interest were the working models shown by Bucyrus-

(Continued on Page 137.)

The EXCAVATING ENGINEER

A Monthly Publication Devoted to Excavating and Allied Subjects

REGULAR SUBSCRIPTION: $1.00 a year for 12 numbers.
SPECIAL SUBSCRIPTION: Upon application on card inserted in this number, subscriber's name will be placed on Rotating List, whereby he will receive The Excavating Engineer frequently (not regularly) free of charge.

THE EXCAVATING ENGINEER PUBLISHING CO.
F. O. Wyss, Manager-Editor Arnold Andrews, Associate Editor
South Milwaukee, Wisconsin
Printed in the U. S. A.

The Business Situation

Some observers have said that the course of business can be definitely forecast by a study of the course of construction. We do not go that far but we feel it is safe to say that the most reliable single indicator of future general business is the construction industry. Theoretically it is logical to point out that building construction involves a great many other industries. Not only does the new building create business for the material suppliers but for furniture and machinery builders as well as many another industry. Experience has shown us that when we face decided improvement in the volume of construction we also face general improvement in business.

In view of this, the present increase in actual construction and the decided increase in contemplated construction is of interest to the business world as a whole, as well as to those of us who are primarily interested in the industry of excavation.

An interesting excerpt from a January release of the F. W. Dodge Corporation follows:

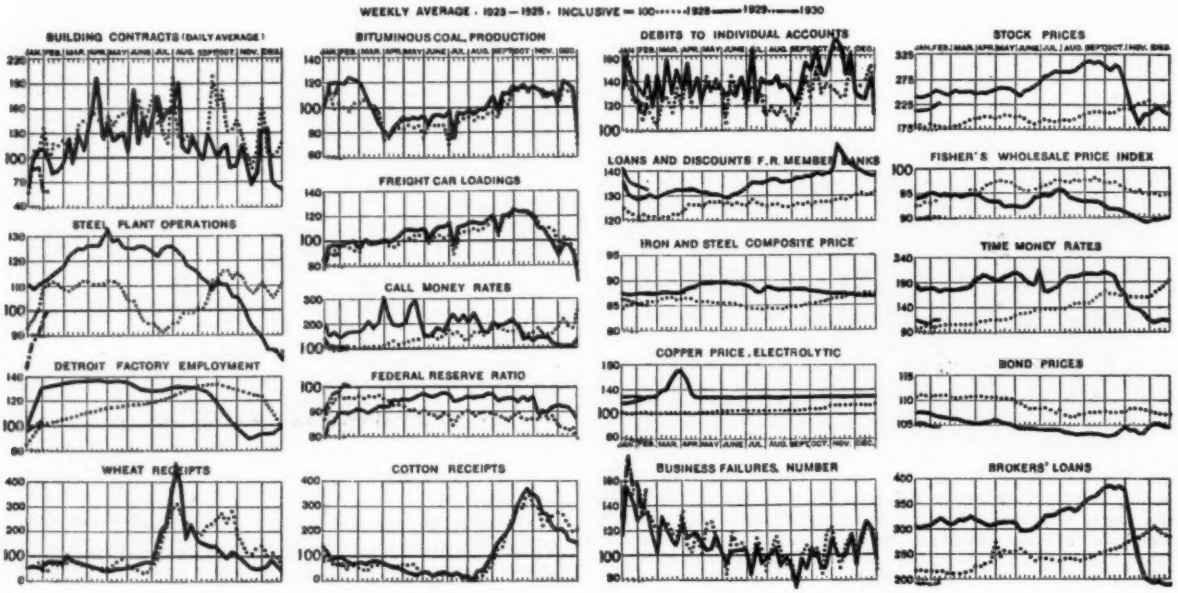
"For the first time in nine years, the January total of building and engineering contracts exceeded the total of the preceding December. It is true that last month's increase over the immediate preceding month was only 2 per cent, but the month of January normally falls behind December and has done so consistently, even in the biggest boom years, such declines having ranged anywhere from 5 to 29 per cent. In January 1921, the contract increase over December 1920 marked the turning point from a prolonged building recession; this January's contract record may likewise mark the turning point of the current recession. In addition to the 2 per cent increase in contracts, January had the highest recorded volume of contemplated new construction.

"Building and engineering contracts let last month in the 37 states East of the Rocky Mountains amounted to $323,975,200. In addition to the 2 per cent increase over December in dollar volume, there was a 4 per cent increase in number of projects reported. The month's contract-volume in dollars was 21 per cent behind that of January 1929. Among the important classes of construction expenditures contracted for in January were: $112,065,200, or 35 per cent of all construction, for public works and utilities; $66,631,900, or 21 per cent, for residential buildings; $54,052,300, or 17 per cent, for commercial buildings; $38,266,200 or 12 per cent, for industrial buildings; and $19,009,200, or 6 per cent for educational buildings.

"Contemplated new work reported in the 37 states during January amounted to $1,455,349,600, by far the largest total of newly-planned work recorded for any single month.

"These contemplated projects represented a 68 per cent increase over the amount reported in December 1929 and a 78 per cent increase over the amount reported in January 1929. Out of this enormous total

WEEKLY BUSINESS INDICATORS



$808,211,400 consisted of plans for public works and utilities projects, including large subway work being planned for New York City, and $647,138,200 for new building work in the plan stage."

It is, of course, true that some of the contemplated work may not materialize, and that some of the work may not be begun as soon as expected, but this situation has undoubtedly been taken into account in that same company's estimate of a total expenditure in the industry of approximately $8,514,000,000 for 1930. This figure is well in excess for the total of 1929 and is about the same as the average for the past five years. A survey by the *Engineering News-Record* indicates that 1930 construction will 'easily equal' if not exceed the figures of 1928 and 1929. According to the Department of Commerce $7,000,000,000 will be the expenditure for public works and utility construction in 1930. The Copper and Brass Research Association estimates a national building program of $9,000,000,000. Railway expenditures given in our January issue as some $800,000,000 to $1,000,000,000 are now estimated at $1,050,000,000.

Another industry that brings us good news at the present time is the steel business. The rate of output to total capacity being 75 per cent as compared with the 40 per cent of December — only ten to fifteen per cent below the figure for a year ago and five per cent below the figure for two years ago — a decided indication of strength at this time of year.

The United States Department of Labor shows an increase in employment — with the largest increase in the automobile and steel industries.

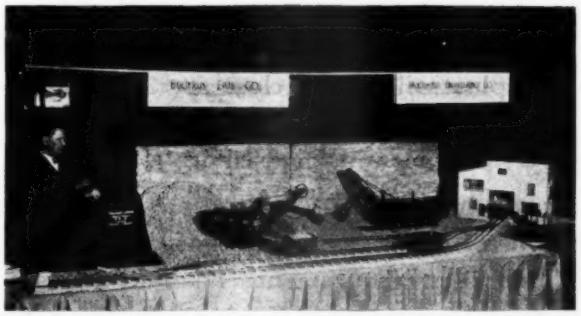
Many of the manufacturing industries closed the year with substantial orders on their books, and a preliminary summary of net profits being made now by the National City Company indicates a net increase in 1929 profits of 12½ per cent over 1928 profits.

The money situation is very satisfactory, there being ample funds available at reasonable interest rates. And this is also of particular interest to the construction man for it is now possible once more to finance construction at normal rates and with cheaper money. Increasing residential building will be in order since mortgages can be had at normal rates.

Echoes of January Equipment Shows

(Continued from Page 135.)

Erie Company and the Woodford Engineering Company. In the model quarry presented, an old-fashioned railroad shovel stood idle on the sidelines while a miniature of the sturdy Bucyrus-Erie 120-B, 4-yard heavy duty quarry and mining shovel operated from standard life-size controls dug the "crushed stone" loading to model dump cars handled from a miniature Woodford Central Control system. Through this remote control cars were run into the crusher house and dumped, switched out and respotted at the shovel in a most realistic and interesting manner.

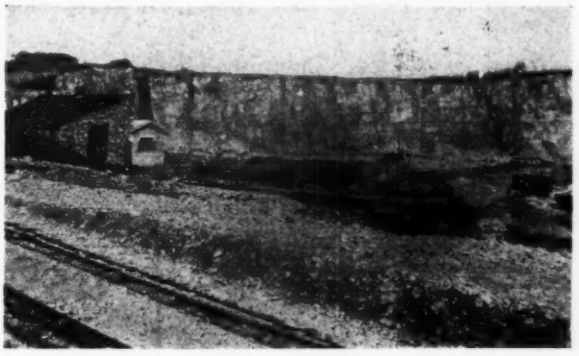


Model Quarry exhibited at the National Crushed Stone Association Convention at Cincinnati by Bucyrus-Erie Company of South Milwaukee and the Woodford Engineering Company of Chicago.

The Cleveland Tractor Company exhibit.

Modern Machines Increase Production in Quarries of "Happy Valley"

(Continued from Page 127.)



General view of quarry.

Modern and Comfortable Homes for Employees

In closing, a mention must be made of the progressive policy of the Vallee Heureuse Company in their social organization. The visitor is struck by the excellent appearance, not only of the plant, but of the little town which has grown up around it. The accompanying photograph of the workmen's houses taken from the air shows that this town has been built on the most modern lines. Most of these houses have been built by the Company itself, and there is also an athletic ground, social hall and employees' store.

At the head of this enterprising concern is Mr. H. Henaux who is personally responsible for the high standard which has been attained throughout. Mr. Henaux was formerly connected with the firm of Henaux Freres, who were one of the parties forming the amalgamation previously referred to.

5 Sizes of "Caterpillar" Tractors
12 Sizes of "Caterpillar" Graders

Tractor prices f.o.b. Peoria, Illinois.
(Based on Standard Equipment)

TRACTORS

Sixty Tractor	$4175.00
Thirty Tractor	2375.00
Twenty Tractor	1900.00
Fifteen Tractor	1450.00
Ten Tractor	1100.00

GRADERS *f.o.b. Minneapolis, Minn.*

Super-Mogul Grader	$1450.00
Super-Reliance Grader	1350.00
Super-Special Grader	850.00
Twenty Grader	700.00
Fifteen Grader	535.00
Ten Grader	420.00
No. 3 Hi-Way Patrol Grader	280.00
Grader Unit for Twenty Motor Patrol	1200.00
Grader Unit for Fifteen Motor Patrol	1000.00
Grader Unit for Ten Motor Patrol	800.00
Sixty Elevating Grader	2375.00
42-Giant Elevating Grader	2100.00

Caterpillar Tractor Co.
PEORIA, Ill., *and* SAN LEANDRO, Calif., U.S.A.
Track-type Tractors · Combines · Road Machinery
(There is a "Caterpillar" Dealer Near You)

CATERPILLAR
REG. U.S. PAT. OFF.

"Caterpillar" Graders *assure accuracy*

What some have called the "biggest shave in history" was successfully performed on the two mile long slopes of the California Water Service Corp. at Clyde, Calif., late in 1929.

Working on 2 to 1 slopes, without tire flanges, the perfect balance and rigid construction of the "Caterpillar" Super-Mogul Grader enabled the Contractor to shave down surplus soil to the close specifications required by the contract—a job, heretofore thought only possible by dozens of men at hand labor.

But even more important to the contractor, 28 days were shaved off a 100-day guarantee of the contract by the aid of "Caterpillar" equipment. Thus do time-saving "Caterpillar" Tractors and Graders win the extra bonus—and other successful contracts—for the man who owns them.

In writing to Caterpillar Tractor Co. please use post card bound in the center of this number.

From the Mail Bag

Beg Your Pardon — and Thank You for Corrections

The Editor:

The Excavating Engineer for January has an article describing in a most entertaining way the operations of this company at Chuquicamata. The author has covered the subject with unusual accuracy for an article of this kind, and I am sure that it will make most interesting reading to anyone interested in South American conditions or in mining camps generally. However, it is very difficult to avoid the creeping in of errors, and in this case I would like to call your attention to two or three mistakes that have occurred.

In the first place, on page 56 in regard to the shovel equipment, the two 225-B shovels, in addition to the 320-B, are mounted on railroad-type trucks and not on caterpillars . . . .

However, there seems to be a misapprehension in regard to the power plant. As you state, this plant is located at Tocopilla, but is at a distance of 87 miles from Chuquicamata. It is not a Diesel plant, but a steam plant, the boilers being oil-fired, the prime movers being turbo-generators. The present installed capacity is 93,000 kilowatts. One of the original 10,000-kilowatt units is now being replaced by a more modern 20,000-kilowatt unit, which will increase the installed capacity to 103,000 kilowatts. The plant is not claimed to be the second largest of its kind in the world. The plant was not built forty years ago, but was first constructed in 1914 as a 40,000-kilowatt plant, when the mining and reduction plants at Chuquicamata were being built. The power plant has been gradually enlarged to its present capacity.

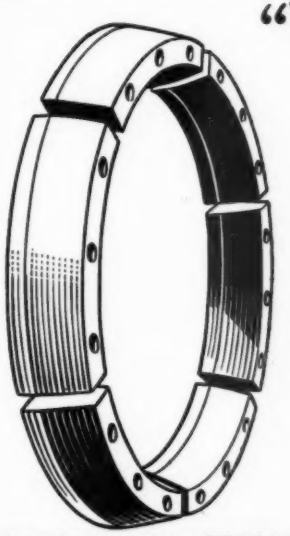
We would appreciate it if you would print a correction in regard to this power plant.

We would like to have some additional copies of the January issue of this magazine. Will you kindly send me about a dozen for our files? If there is a charge for this, kindly mark the invoice to my attention.

Very truly yours,

(s) W. D. B. METTER, JR.
Assistant to Vice President.
Chile Exploration Company,
25 Broadway,
New York, N. Y.

Our apologies to the Chile Exploration Company and to our readers. The Excavating Engineer attempts to carefully check its material to prevent publication of any inaccurate statements. In this connection the author, Nina Lane, explorer and treasure hunter, evidently accepted inaccurate local information regarding the power plant at Tocopilla. In justice to her we would like to add that we have always found her stories based on careful personal investigation. — Editor.



"Will Last the Lifetime of the Shovels"

Says R. R. Contractor of Asbesgraphite Frictions

"Our three Bucyrus-Erie 50-B Diesel Shovels", says a prominent railroad contractor, "handled approximately 2,000,000 yards of one job, after your frictions were installed, without a moment's delay attributable to the swinging frictions. They operate with a smooth, yet decidedly firm grip, speeding up operation considerably and improving the operating efficiency of the shovels. Prior to installing Asbesgraphite Frictions, we were constantly making adjustments of swinging frictions or replacing the asbestos lining. *It seems now as though these frictions will last the lifetime of the shovels.*"

Eliminate your friction block problems by using Gatke Asbesgraphite Frictions. They are self-lubricating, non-scoring and non-grabbing.

Write for prices, today!

Manufactured by THOMAS L. GATKE, Room 2142, 228 N. La Salle St., Chicago, Ill.

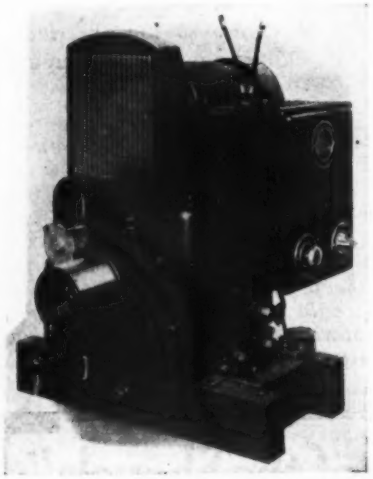
GATKE-ASBESGRAPHITE
BRAKE BLOCKS AND FRICTIONS
CARRIED IN STOCK FOR ALL INDUSTRIAL EQUIPMENT

EQUIPMENT YOU OUGHT TO KNOW ABOUT

Light Plant for Auxiliary Service

A light plant particularly adaptable for use on excavating equipment has been recently developed by *Fairbanks-Morse & Company.* This independent lighting unit will supply a steady candle power, and may be operated when the main power plant of the shovel, dredge, etc., is not in operation.

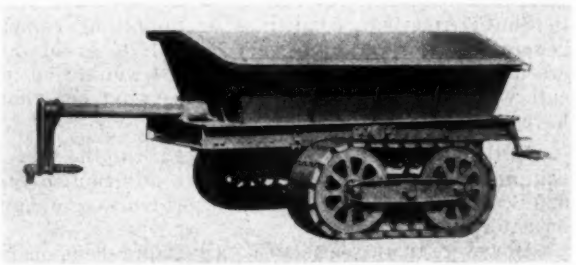
Built in two sizes of 750 and 1,500 watts capacity, this unit is finding favor because of its simplicity of design, sturdiness of construction, reliability and freedom from excessive maintenance and supervision charges. In the assembly the power unit, the ignition system, the generator end and the control mechanism are maintained as separated units, not being tied up in any way that introduces complication. The engine used is the Fairbanks-Morse Self-Oiling "Z" engine with high tension magneto ignition. The smaller 1½ h.p. unit is designed to operate on gasoline, while the 3 h.p. engine can use either gasoline or kerosene. The generator is a ball-bearing machine mounted as a unit directly above the engine, being driven with a Flex-Mor "V" type belt. Either size is offered with a variety of storage battery combinations, which will meet almost any demand for either a 32-volt or standard 115-volt circuit. Both can also be furnished for direct lighting, in which case a special control panel is provided, and on which is mounted an ammeter and a field rheostat which permits of voltage regulation to meet the demands of the load.



Fairbanks-Morse & Company, Chicago, Illinois, will be glad to send complete information on this new lighting unit upon request. When writing please mention *The Excavating Engineer.*

Davenport "Cat-Tread" Dump Wagons

A new line of crawler-type dump wagons, the "Davenport Cat-Tread Wagons," has recently been announced by The *Davenport Locomotive and Manufacturing Corporation, Davenport, Iowa.* These wagons, so the manufacturer claims, are suited to all types of earth-moving operations where loading is done with power shovels or elevating graders. Their large capacity and their ability to operate successfully regardless of weather or surface conditions, permit them to move much greater yardage than with the use of teams or ordinary round wheel dump wagons. The large supporting area of the "Cat-Treads," combined with the use of Timken bearings in the wheels, make it possible to haul full loads with

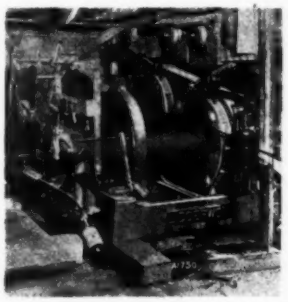


minimum tractive effort under the most adverse conditions.

Davenport Cat-Tread Wagons are at present made in two sizes of 5 and 7 cubic yards capacity, which may be increased from one to two yards by the application of an auxiliary side board readily fitted to the low side of the dump body. They are made at present only with bottom dump, the doors dropping vertically, permitting free discharge of the load, and non-interference with the dumped material. An attractive and informative catalog will be mailed on request. In writing to the manufacturer, please mention *The Excavating Engineer.*

New Lidgerwood Safety Hoist

Announcement of the new Lidgerwood Steel Erector's Safety Hoist was withheld by the manufacturer until the success of these hoists in practical work was proved. The accompanying illustration shows this new hoist, which is equipped with emergency brakes which are automatically set in case of either power failure or neglect of the lever man to keep his feet on the service brake levers. It is built in the 100 h.p. size, duty 9,000 lbs. at 300 feet per minute, for operation with three-phase, 60-cycle, alternating current at 220 volts. A model is also available for 440-volt operation on special order.



Other features of the machine are conventional. The drive between motor and hoist is a silent chain belt totally enclosed in an oil-tight casing. All gearing is of cut steel protected by guards. Wiring is enclosed in armored metal conduit, and resistors are of the non-breakable edgewound type.

Further information regarding these new safety hoists may be obtained by writing the *Lidgerwood Manufacturing Company, Elizabeth, New Jersey.* Please mention *The Excavating Engineer.*

SHOTS FROM THE FIRING LINE

Does This Record Still Stand?

Over the luncheon table Messrs. Benson and Kaiser, railroad contractors of St. Louis, Missouri, recently told Excavating Engineer Correspondent H. H. Buchanan an interesting tale about some of their railroad work in the Northwest when they were with Grant-Smith and Company. This particular story centers about a Model 65 Bucyrus-Erie railroad-type shovel, shop number 55, which was equipped with a 2½-cubic-yard dipper, railroad truck mounting and also had the latest type of hand friction "at that time" for the several digging motions. Messrs. Benson and Kaiser vouch for a record made with this machine while on the Southern Pacific work at North Bend, Oregon, in 1914 of 1,260 four-yard cars in 12 hours. This record is certainly a remarkable one, even though Messrs. Benson and Kaiser add that the material dug was sand. They doubt whether any of the modern type of machines can equal this record for the number of cars loaded.

How about it? Does any reader know of a record to beat it?

Plans Completed for Trans-Isthmian Highway, Panama

Plans for the Trans-Isthmian highway were completed by the Assistant Engineer of Maintenance, The Panama Canal, recently. The following cost estimates have been made: Survey, cost per mile, $980; Grading, cost per mile, $60,000; Surfacing, cost per mile, $36,000; Bridges, cost per mile, $20,000; Culverts, cost per mile, $11,000; Miscellaneous expenses, cost per mile, $6,000; Average cost per mile, $133,980. Total cost of highway, $6,000,000. The highest altitude reached is 482 feet. The road will require 10 culverts to the mile and a total of 46 bridges. The length of the proposed road is 46 miles.

New England Notes

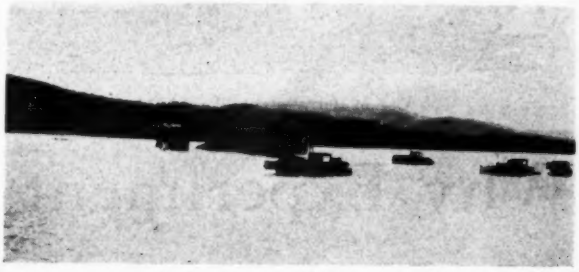
BY J. C. ALEXANDER

The accompanying illustrations showing trenching operations of **T. Stuart and Son Company of Watertown, Massachusetts,** on a heating tunnel in Cambridge, Massachusetts. This organization is using their 1030 drag shovel to good advantage for this digging and loading the truck. They have purchased their second Bucyrus-Erie Type 1020 this year.

Canada

Montreal and Vicinity

BY C. V. OSBORN



G. Martel, Montreal contractor, has two Bucyrus-Erie B-2's working at Tide Head, New Brunswick, loading gravel into trucks from the head of the Restigouche River. The above illustration shows all the equipment caught by the tide.

Eastern Notes

BY ROBERT M. ROGERS

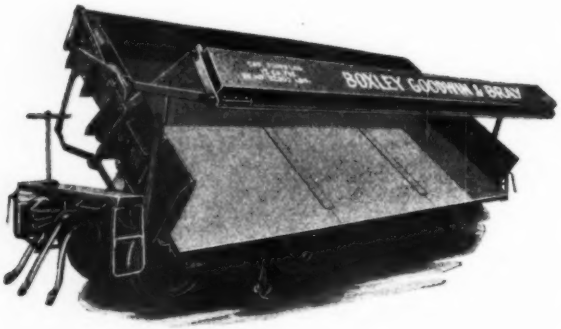
New York Air Terminals, Inc., headed by the veteran earthmover William F. Carey, is reclaiming Jersey Meadows, formerly a mosquito breeding swamp at Secaucus, New Jersey, into what is claimed to be the greatest and most complete airport in the world. The above picture, furnished us through the courtesy of the Cleveland Tractor Company, shows a Bucyrus-Erie B-2 shovel loading into a Mack truck in cutting away an available embankment, material from which is to be used for temporary roads through the property. The tract which is being improved consists of more than one thousand acres lying along the Hudson River, and only ten minutes from Times Square after completion of the contemplated tunnel under the Hudson River on 38th Street. The bulk of the earth moving, requiring about five million cubic yards of fill, is being handled by the Standard Dredging Company with their hydraulic dredges.

Vincent Schiavi of Buffalo was recently awarded a contract for grading, draining and incidental work on the Mount Vernon Boulevard by the Public Roads Bureau of Washington. His bid of $435,000 was the lowest of 25.

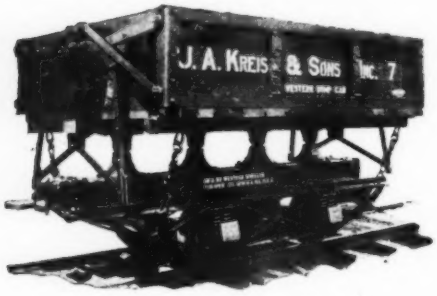
Col. John Oehmann, District Building Inspector for Washington, D. C., is optimistic about the prospects for 1930 building. He reports that permits were issued in January for $4,000,000 worth of projects as compared with $2,500,000 in December 1929. He predicts that $45,000,000 worth of build-

One of 100 Western 30-yard Drop Door Air Dump Cars at work on the new Cincinnati Terminal

Why Experiment With Dump Cars? You *Know* That *Westerns* Are Right



Western 12-yard Dump Car



Western 4-yard Dump Car

RELIABLE Western dump cars on any job requiring dump car haulage will practically insure your profit. Often the fact that you intend to use Westerns will cinch the contract, for Western dump cars are recognized by those having contracts to let as "satisfactory dump car equipment."

Western dump cars are made in every practical size and of both lift door and drop door type. Whatever your contract we can furnish a Western car of the size and type best fitted to handle the haul satisfactorily in every way. Western cars are strong; easily repaired; ride a rough track; stay on the job and when the job has been completed are still practically as good as new.

Western dump cars are fully described in Catalog 71-K. Where shall we send your copy?

Western Wheeled Scraper Company

Aurora, Illinois, U. S. A.

WESTERN

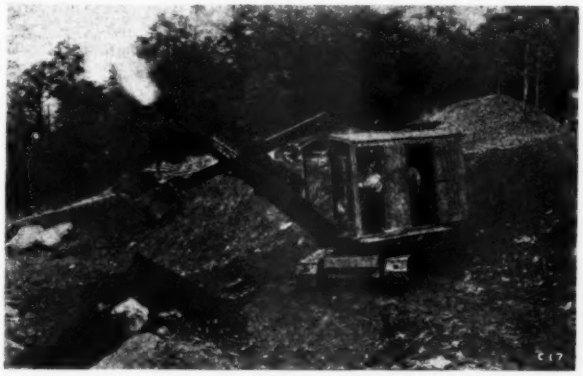
Western

DUMP CARS AND GRADING EQUIPMENT

In writing to Western Wheeled Scraper Co. please use post card bound in the center of this number.

SHOTS FROM THE FIRING LINE — Continued

ing will be started in Washington not counting Government projects. While this represents a decrease from the $58,000,000 total of last year's projects, Col. Oehmann considers it a normal volume.



W. A. Shafer Construction Corporation of Poughkeepsie had an interesting job last season about 25 miles north of Kingston in the heart of the Catskills. The excavating operations called for cutting a level floor on the top of Beechwood Mountain and dumping the material over the side in order to make a site for a hunting lodge for Richard Hellmann, millionaire manufacturer of Blue Ribbon salad dressing. The digging was very hard — rock, stumps and hard pan. Two gasoline machines attempted the job but were unable to give satisfactory results. The W. A. Shafer Construction Corporation then moved in the above Bucyrus-Erie ½-yard steamer, a Type A, which finished the job satisfactorily with everyone happy.

Baltimore and Vicinity

BY S. M. CHRISTHILF

The Arundel Corporation's preliminary preparations on the Pennsylvania Water and Power Company's dam at Safe Harbor, Pennsylvania, are quickly taking shape so that this job should be in full swing after the first of the year.

The Pennsylvania Railroad is rapidly acquiring property necessary for their $22,000,000 tunnel and terminal improvements, and also electrification in Baltimore City. Work on this project is expected to start in the spring.

The Bethlehem Steel Company is making improvements at their Sparrows Point, Maryland, plant totaling an expenditure of $20,000,000.

The Maryland State Roads Commission has announced a road program for 1930 amounting to $14,000,000. It is expected that the work will be advertised during the winter months so that it can get an early start.

Harry T. Campbell Sons Company was the low bidder on the construction of a bridge at Cockeysville, Maryland, for the Pennsylvania Railroad Company.

The Empire Construction Company of Baltimore was low bidder on the Maryland State Roads Commission contract for construction of a bridge at Cockeysville. The work involves about $200,000.

Virginia Notes

BY J. P. MC CLOSKEY

The above illustration shows G. Y. Carpenter's Bucyrus-Erie Gas + Air loading to Western Wheeled Scraper, Athey-Truss-mounted wagons, hauled by Caterpillar tractors, in grading for the Dodge Sea Plane factory at Newport News, Virginia. At first thought it would seem that when the Nation goes into the air the grading contractor might be out of a job, but from the many recent reports of grading work in connection with aviation, it looks as though the dirt mover will still have plenty to do even though we are going to do a great deal more traveling in the air.

Allis-Chalmers
Monarch Tractors

Offer the lowest cost drawbar horsepower in their class.

ALLIS-CHALMERS MFG. CO.
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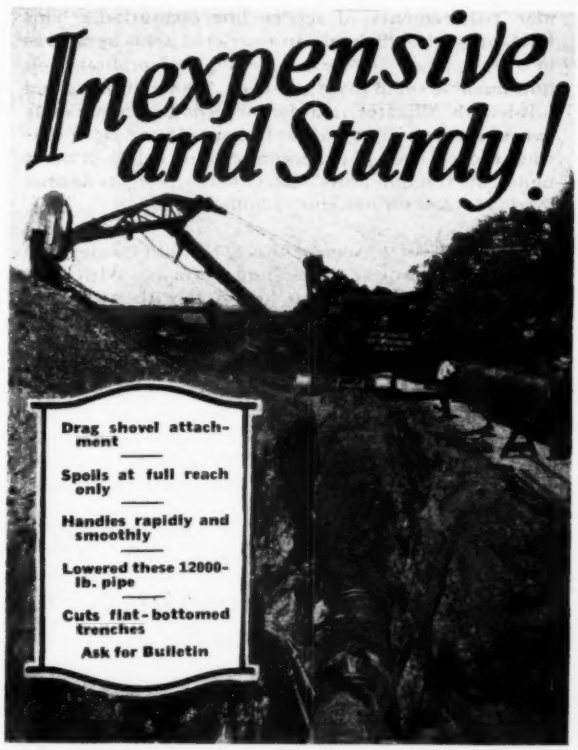
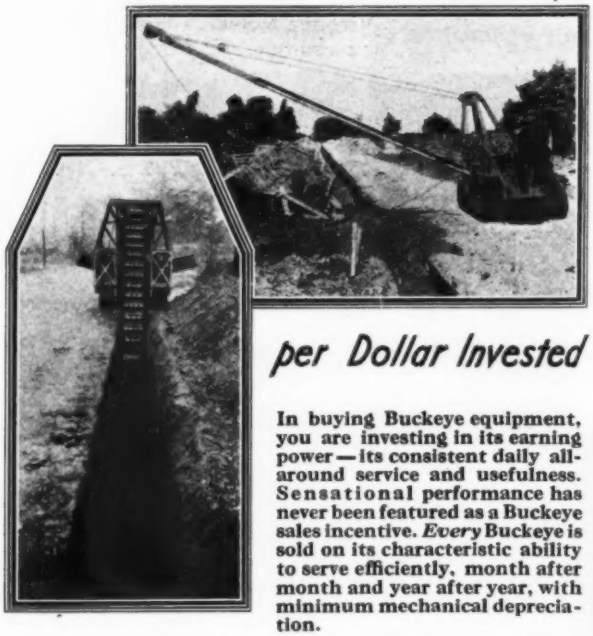
"75" — "50" — "35"



PAGE ENGINEERING CO. 844 RUSH ST. CHICAGO — ILL.
DRAG SHOVELS—DRAG LINES—BUCKETS—SLACK LINES—DIESEL ENGINES

Consider Maintenance
Greater Earning Capacity-



per Dollar Invested

In buying Buckeye equipment, you are investing in its earning power — its consistent daily all-around service and usefulness. Sensational performance has never been featured as a Buckeye sales incentive. *Every* Buckeye is sold on its characteristic ability to serve efficiently, month after month and year after year, with minimum mechanical depreciation.

Buckeye Model 140 Service Trencher **is small in size but big in working ability. It meets ideally the particular requirements of service line excavation. This Buckeye works efficiently in restricted areas as well as in open spaces. It operates rapidly and profitably on innumerable small main trenches. Power steering and full-length Alligator (crawler) wheels give remarkable ease of control. Two bucket line speeds and eight cutting speeds. Even at maximum digging depth, it never undercuts traction units. Safety device protects against overload. Ask for descriptive bulletin.**

Buckeye Model F Service Backfiller **supersedes and antiquates improvised backfilling methods. With overall dimensions of 69 inches in width (without boom), 7 feet 6 inches high and weighing but 4 tons, it is easily maneuvered along restricted right-of-ways or transported from one job to another. Its adjustable-length boom has a swinging range of 160 degrees, and is conveniently raised or lowered. "Back-action" scraper feature enables it to work from the spoil-bank side of the ditch. It is ideal equipment for refilling small and medium-size trenches. Write for specifications and performance data.**

The Buckeye Traction Ditcher Co.
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There's a Buckeye Sales and Service Office Near You

for over thirty years **Buckeye**

SHOTS FROM THE FIRING LINE — Continued

Philadelphia and Vicinity

BY J. F. TAIT

E. Riley Mixner of Ocean City, New Jersey, and Versaggi Bros. of Wildwood, New Jersey, are starting their seven-mile road job in Lenhartsville, Pennsylvania. They have already cut in two Type "1030" gas shovels, one Gas + Air, one Type "B" and one "B-2," all Bucyrus-Erie machines, and also one Northwest Shovel.

W. Grant Reub of Red Lion, Pennsylvania, are getting ready to start on their seven-mile job in Schuylkill County over Blue Mountain. They have 300,000 cubic yards of excavation on this job. This will be the last link in improved highway between Allentown and Tamaqua.

H. R. Miller Co. of Lancaster, Pennsylvania, is low bidder on a Lancaster County four-mile job.

The Continental Contracting Co. of Baltimore, Maryland, are cutting in their new Bucyrus-Erie Gas + Air shovel at the Delaware Water Gap on highway work. This machine was bought on the floor at the Road Show in Atlantic City, New Jersey.

West Virginia Notes

Clyde E. Roop, operator for Nicholas County Court at Summersville, West Virginia, sends us the above picture of some tough rock digging that he recently handled. Mr. Roop is most enthusiastic about the Bucyrus-Erie B-2 and tells us that it has the cheapest upkeep costs of any machine he has operated, and has the best caterpillar-type mounting that he has ever used. "I consider the Bucyrus-Erie far ahead of any I have ever seen in use," continues Mr. Roop. "It is easy to operate and easy for me to keep up." Clyde tells us that he handled 4,850 cubic yards in five straight days with the B-2, all of it hauled and no waste.

Detroit and Vicinity

BY J. S. WALDINGER

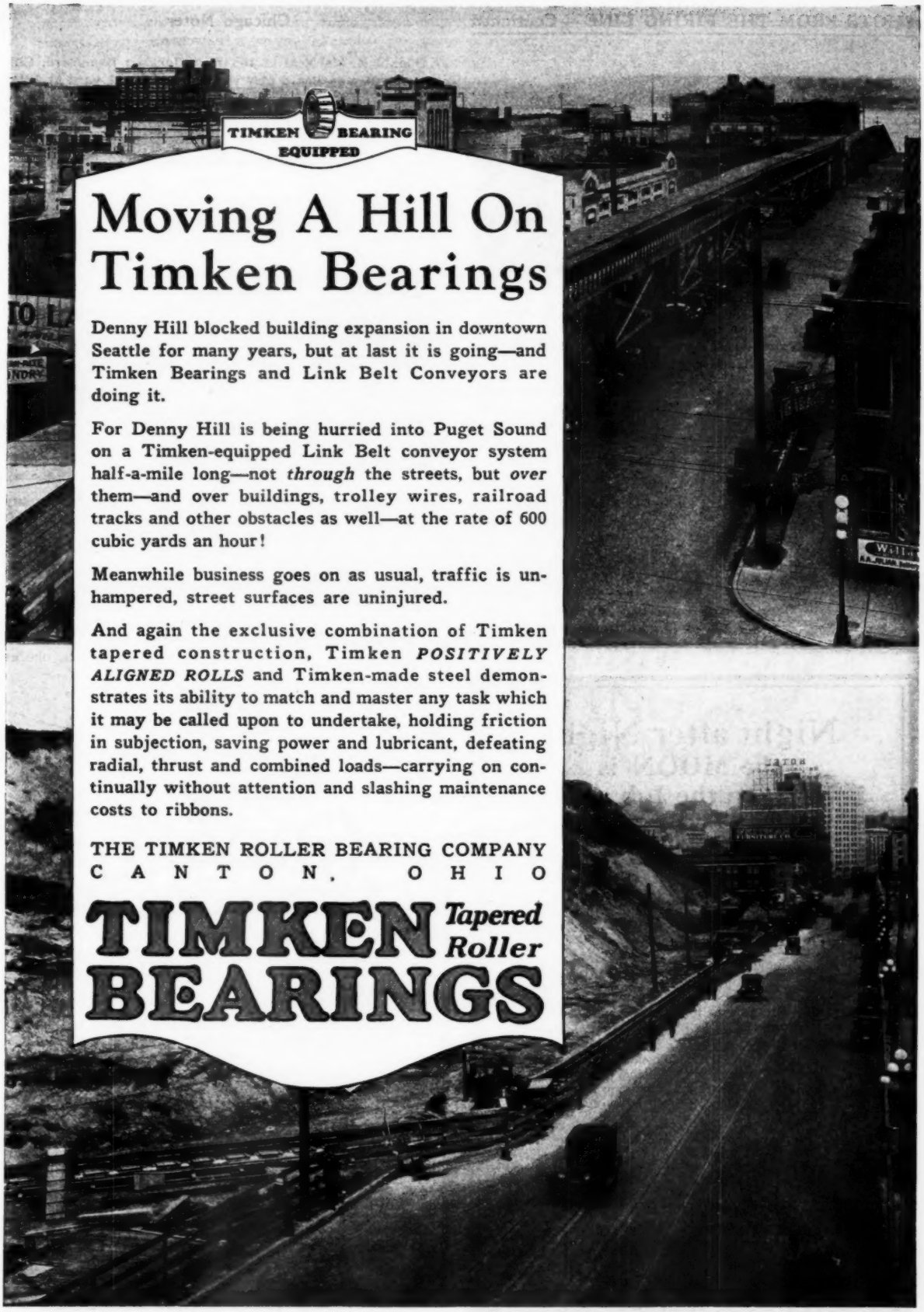
One of **S. A. Healy's** 50-B steam machines is actively at work driving wood-piling in connection with his Lonyo sewer job and the new Ford water intake tunnel.

Jutton-Kelly Company, railroad contractors, are keeping their Bucyrus-Erie 30-B steamer and two Bucyrus-Erie Gas + Air machines actively engaged on the Pere Marquette grade separation work in Detroit.

The J. A. Mercier-Brandon Company have their two Bucyrus-Erie 50-B steam draglines rented at the present time, but are keeping their smaller equipment, including a 30-B Diesel and a Type-1030 Bucyrus-Erie, diligently busy on sewer work and water main construction.

S. E. Johnson of Toledo, Ohio, has two Bucyrus-Erie Type-B shovels busy on the new dock development project of the Shell Oil Co. of Toledo.

Contractor Hector Denolf of Grosse Pointe Park digs a heap of dirt each season with his fleet of three Bucyrus-Erie B-2's. Heres' one of his B-2 steamers. Isure Cyr, operator, just getting ready to unload after a buggy ride on a Fruehauf



Moving A Hill On Timken Bearings

Denny Hill blocked building expansion in downtown Seattle for many years, but at last it is going—and Timken Bearings and Link Belt Conveyors are doing it.

For Denny Hill is being hurried into Puget Sound on a Timken-equipped Link Belt conveyor system half-a-mile long—not *through* the streets, but *over* them—and over buildings, trolley wires, railroad tracks and other obstacles as well—at the rate of 600 cubic yards an hour!

Meanwhile business goes on as usual, traffic is unhampered, street surfaces are uninjured.

And again the exclusive combination of Timken tapered construction, Timken *POSITIVELY ALIGNED ROLLS* and Timken-made steel demonstrates its ability to match and master any task which it may be called upon to undertake, holding friction in subjection, saving power and lubricant, defeating radial, thrust and combined loads—carrying on continually without attention and slashing maintenance costs to ribbons.

THE TIMKEN ROLLER BEARING COMPANY
C A N T O N, O H I O

TIMKEN *Tapered Roller* **BEARINGS**

SHOTS FROM THE FIRING LINE — Continued

Trailer owned by Furnari Brothers. With a Mack truck hitched up front they rolled right along to this location on Tarnow and McGraw, where operator Cyr and the B-2 are to dig a basement for contractor John Pucula.

William Barton of Kalamazoo, Michigan, is operating a Bucyrus-Erie Type 1035 for Adams & Lotte of Kalamazoo.

Indiana Notes

BY C. F. BARTON

The accompanying illustration shows a Bucyrus-Erie 1020 clamshell owned by the **Indiana-Michigan Electric Company** loading trucks from stock pile, at South Bend, Indiana.

Chicago Notes

BY W. K. FAWCETT

Donald B. MacNeal of 166 West Jackson Boulevard, Chicago, **recently opened a new storage equipment yard** at 121st and Loomis Streets. The location is on the Chicago, Rock Island & Pacific Railroad, and space is available for contractors to store equipment.

Wisconsin Notes

BY C. W. HAY

Operations of the Elkart Moraine Sand & Gravel Company are illustrated above. They are using a Bucyrus-Erie 41-B electric for loading gravel into cars, making an average production of 2100 tons for eight hours. Production as high as 2500 tons in seven hours has been obtained. The Blaw-Knox bin in the background of the picture is used for handling material from stock piles to the trucks; loading of the bin being handled by a Bucyrus-Erie clamshell. Western dump cars are used for hauling materials to the plant. The Elkart Moraine Sand and Gravel Company have two plants, one at

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on the Job

MOON Turbo Generators
Capacities—1 to 4 K W

STEADY, reliable performance — that's the first thing a contractor looks for in a lighting plant. The MOON has a reputation for being right on the job, night after night. In addition, it requires a minimum of attention, is simple and economical to operate. And they last a long time. That's why you find so many MOONs on construction jobs today.

MOON Lighting Plants are made in a large variety of styles and sizes. Let us send you Bulletin No. E-1.

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LUBRICANTS

SHOW UP WELL
UNDER THE MOST
SEVERE CONDITIONS

WATERPROOF, WEATHERPROOF,
SHOCK PROOF AND EFFICIENT

Start the season right. Profit by the experience of leading makers and operators of shovels, cranes, hoists, ditchers, crushers, conveyors and mixers, who use and recommend these time-tested aids to continuous and economical operation. Write for catalog and information.

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Unit of Union Carbide UCC *and Carbon Corporation*
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ROPE
for
all
PURPOSES

A nation wide DISTRIBUTING ORGANIZATION *.... at your service*

A plant, operating 24 hours daily, building quality into Wire Rope, and an engineering staff to give the user expert advice and efficient co-operation.

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is the most
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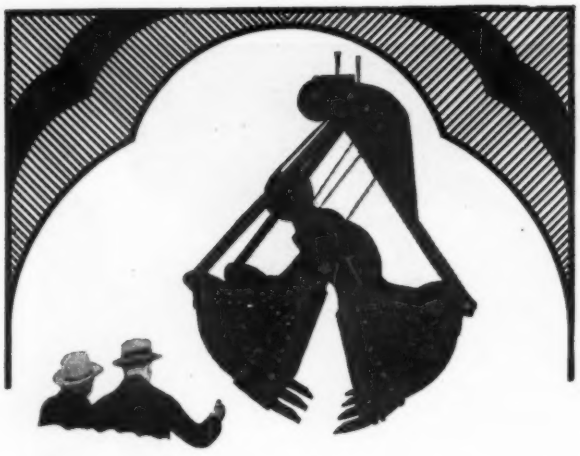
PLOW STEEL

AMSPORT

In U.S.A. & Canada Patents Pending



Men who *know buckets*-

have rated the new Williams "Champion" as *"the most powerful digger built!"*

From its rigid narrow head to its forged chrome nickel steel teeth, the new Williams "Champion" is even more rugged and powerful than the old Williams "Hercules."

It will dig even harder materials—and that's *digging!*

Inspect this new Williams "Champion," and watch it in hard digging. In competitive tests, with other buckets of the same size rating, it shows its "class". *It's put on your work with a definite guarantee to Outdig and Outlast any other bucket.*

For a description of the Williams "Champion," drop us a line for Bulletin SP-25.

G. H. WILLIAMS COMPANY

603 Haybarger Lane, Erie, Pa.

Branch Offices: New York, Pittsburgh, Chicago

WILLIAMS
FAST-DIGGING BUCKETS

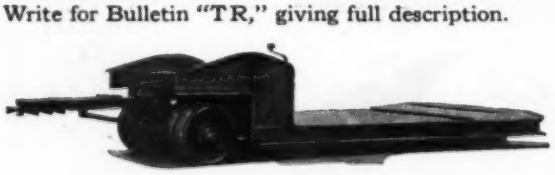
140

For moving heavy equipment—

The new 5-axle Williams "Arch-Girder" Trailer combines all the good points of modern trailer design, and new improvements that give *bigger load capacity without increased weight.*

A separate short axle for each rear wheel—no overhang. This trailer is years ahead for Capacity—Convenience—Dependability.

Write for Bulletin "TR," giving full description.



SHOTS FROM THE FIRING LINE — Continued

Glenbeulah on the Chicago & Northwestern Railway, and one at Elkart Lake at the Chicago, Milwaukee & St. Paul Railway. The plants produce bank-run gravel, coarse sand, mason-plaster sand, pea gravel, roofing gravel, grading gravel and gravel to any size.

Missouri Notes

BY H. H. BUCHANAN

Stone and Webster Engineering Corporation of St. Louis, Missouri, are progressing rapidly with their work on the 30-million-dollar dam project near Bagnell, Missouri. A recent report gave the total men employed at the dam site and in the reservoir area at 1530. Track on the temporary railroad bridge across the Osage is complete, and trains are now being run to the west side of the reservoir. Work has been started

for the material storage tracks on the west bank, and the new Bucyrus-Erie Gas + Air with 24-foot boom and 18-foot sticks is building a dike to retain the hydraulic fill for the plant area as shown in the accompanying illustration. A schoolhouse on the dam site has been recently completed, and schoolmarm Maggie Wotem is teaching 27 youngsters their readin', 'ritin' and 'rithmetic.

BY A. J. KOENIG

The Missouri Highway Commission recently let contracts for grading and paving amounting to approximately $1,000,000. This is the initial letting of a program of construction and grading of highways which will total $30,000,000 for the year.

The following contractors were successful bidders: Clark, Kearney & Stark, Louisiana, Missouri, 2.8 miles grading in Pike County, $39,067; W. A. Ross Construction Co., Kansas City, 3.291 miles and 3.24 miles in Wayne County, $41,782 and $32,433; O. O. Fuller, Nevada, Missouri, 4.67 miles in

MEETING PLACE OF CAPITAL AND LABOR

THE KOENIG LABOR AGENCIES

Established 1875

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Main 2766 and 2767

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Electric shovel loading cars in open-pit iron mine, Hibbing, Minnesota.

Electric shovel in rock quarry, Bonner Springs, Kansas

A Tireless Arm and a Powerful Jaw --*Electrically Driven*

A RAPID swing, a smooth halt, jutting jaws gape, and then the swing back. The tireless arm thrusts, the jaw bites. A hoist—and the outfit again swings swiftly to load waiting ore cars.

Each operation in the cycle: swing, thrust, and hoist, is performed with day-after-day dependability by the aid of electric drive. Its advantages: smoothness, rapidity in operation, low maintenance cost, and long useful life, are known to operators of shovels equipped with G-E Motorized Power. Ward-Leonard control enables nicety of manipulation.

In every size from 1 1 2 to 16 yards. wherever a shovel is needed, G-E Motorized Power, behind the bucket, efficiently and abundantly furnishes driving power for electric shovels. For d tailed information, call your local General Electric Office, or address the General Electric Company, Schenectady, N. Y.

JOIN US IN THE GENERAL ELECTRIC HOUR, BROADCAST EVERY SATURDAY AT 9 P.M., E.S.T. ON A NATION-WIDE N.B.C. NETWORK

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1. Faster drilling
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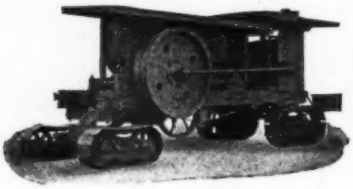
. . . *reasons why* there are more Loomis "Clipper" Blast Hole Drills in use than any other make.

Write for further information to



THE LOOMIS MACHINE COMPANY
(Established 1842)
K Street, TIFFIN, OHIO

Let This Machine Shift and Raise Your Track

Raising the outside rail preparatory to shifting track over to the edge of the dump. All the shifting and raising on this waste dump was done by a few men with the aid of a Track Machine. Wherever track must be shifted or raised and a track gang is maintained, this machine is a real necessity in reducing costs and speeding up work.

Write for Bulletin GR-8.

NORDBERG MFG. CO., Milwaukee, Wis.

THE NORDBERG PATENTED TRACK MACHINE

SHOTS FROM THE FIRING LINE — Continued

Pettis County, $51,442; C. H. Atkinson Paving Co., Watertown, South Dakota, grading and concrete paving, 3.465 miles $33,379, 2.91 miles $30,658, 1.75 miles $18,348, 3.84 miles $48,823, all the above in Linn County, 8.99 miles in Livingston County at $95,684; M. E. Gillioz, Monett, Missouri, grading and paving .209 miles in Newton County, 3.03 miles in Cole County, 3.94 miles in Morgan County, also bridge in Newton County; J. A. Kerr, Ozark, Missouri, two sections in Lawrence County, $75,504; A. W. Mosley, Kansas City, graveling .872 miles in Carroll County, $8,454, 3.462 miles in Miller County to Davis Construction Co., Boonville, at $68,828; H. Lidd, Hutchinson, Kansas, 8.986 miles and two bridges in Knox County; C. K. Kost, Joplin, Missouri, 4.95 miles in Oregon County and 2.73 miles in Wright County; R. H. Sharp, Reeds Springs, 2.688 miles in Wright County; Knutson Bros., Kansas City, 6.295 miles and seven bridges in Nodaway County.

Riley Contracting Co. of St. Louis was low bidder for additional sewerage at the St. Louis Municipal Airport with a bid of $29,573. Nine bids were received on this project, the lowest of which was 17 per cent below the engineer's estimate. G. Locke was second low bidder with an offer of $29,789.

Montana Notes

Andrew Wiggin, operator for the United States Indian Service at Pablo, Montana, sends us the above recent picture of the Bucyrus-Erie Class-9½ dragline he is operating for the Indian Service. Says Andrew: "This old faithful moved 165,223 yards of dirt in eight months, including 15 days for repairing and so on running two shifts. Not bad for an old-timer with a one and one-half cubic-yard bucket.

Washington Notes

Among recent contracts awarded by the Director of Highways at Olympia were: to **L. J. Dowell, Incorporated, of Seattle**, clearing, grading, draining and surfacing of 5.3 miles of State Road No. 2 from Fall City west, in King County, including 96,220 cubic yards of excavation, 18,730 cubic yards of crushed stone surfacing; to **C. L. Creelman of Seattle**, clearing, grading, draining and surfacing of 0.9 miles of State Road No. 14, Burley to Pierce County Line in Kitsap and Pierce Counties, including 20,350 cubic yards of excavation, 2060 cubic yards of crushed stone; to **S. A. Moceri, Incorporated, of Tacoma**, clearing, grading, draining and surfacing about 2.0 miles of State Road No. 21 Silverdale to Keyport in Kitsap County, including 75,650 cubic yards of excavation and 8510 cubic yards of crushed stone surfacing.

Oregon Notes

BY J. M. ROBINSON

The Phoenix Utility Company is making good progress on the large hydro-electric project on the Lewis River in Washington, located about 45 miles from Portland, which they are building for the Northwestern Electric Company. Two Bucyrus-Erie Diesel + Air machines are being used on this opera-

Rugged Strength and Reliability—Spells Efficiency and Economy

Demand the trade-mark of JOHNSTON and you'll get the best.

More than 5,000 Johnston Boilers located all over the world are meeting and passing daily tests of the severest nature on every type of contractors' equipment.

Now is the Time to Replace Old Boiler Equipment—

CHECK up today! Eliminate all possibility of boiler breakdown during this coming season.

Perhaps you have a Johnston Boiler which has been in use a great many years—regardless of its age, size or shape, we can duplicate it for you in a new and possibly more efficient type.

A new boiler in place of the old one may mean greatly increased profits due to the elimination of all expensive shut-downs caused by faulty boiler equipment.

Let a *Johnston* expert help you with your boiler problem. For over 65 years Johnston Brothers have been building boilers to help speed the world's work.

If you will just say the word we will be pleased to co-operate with you. Write, phone or wire.

JOHNSTON BROS., Inc., FERRYSBURG, MICH.

Specializing in Boilers for Contracting Equipment

USE THIS COUPON

I desire a boiler for the following machine:

Name of Machine_____ Model or Size No._____

Type of Boiler_____ Diameter and Length_____

Firm Name_____ Address_____

City_____ State_____

In writing to Johnston Bros., Inc., please use coupon or post card bound in the center of this number.

THE MEASURE of WIRE-ROPE QUALITY IS THE SERVICE IT HAS RENDERED

Which wire rope to use on your equipment—which brand will give the longest and most economical service—may be best determined by past records of performance established under similar operating conditions. This and the reputation of the maker are of paramount importance.

FOR over half a century American Wire Rope, made exclusively by the American Steel & Wire Company, has demonstrated its superiority—proved beyond question that its tough, flexible and abrasion-resistant nature is the best insurance against breakdowns and costly delays.

Regardless of your particular problem, you will find an American Wire Rope exactly adapted to its economical solution. Consult our nearest branch office or distributor to get the right rope for your purpose.

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U. S. Steel Products Co.: San Francisco, Los Angeles, Portland, Seattle, Honolulu

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SHOTS FROM THE FIRING LINE — Continued

tion. These machines built a road into the dam site, and are now working on foundation and abutment excavation, one machine on each side of the river.

BY M. D. TROYER

The above illustration shows **Shelvin-Hixon Company's Bucyrus-Erie D-2 building logging roads.** They are working in lava rock country on steep buttes. Formerly this work was handled with tractors and scrapers, grade being finished with graders pulled by tractors. During the past year, however, they have been getting into heavier work where it was necessary to use a shovel. After very careful investigation they selected a Bucyrus-Erie D-2, and they have found it to be an exceptionally satisfactory and economical machine for this type of work. Fuel consumption averages from 12 to 15 gallons per day, with an output averaging approximately 650 yards per day. The operator, formerly one of the tractor drivers on Shelvin-Hixon operations, had never operated a shovel before. He is having very good success with the D-2, however, and is very proud of the results he is getting.

Requires Less Line Pull-Costs Less to Operate

A POWER PLOW easily cuts dirt. Its shearing action minimizes the line pull and it requires less power. 4000 years have proved that this principle cannot be improved. . . . POWER PLOW SCRAPERS are essentially right and left hand plows. They alone offer all these plow advantages. They require less power to operate, have greater digging ability. In addition, they present less resistance against line of pull, eliminate hoist overstrain and prevent spilling of load. . . . These advantages of Power Plow Scrapers will cut your excavating costs. . . . Write for information.

THE GARST MANUFACTURING CO., 549 W. Randolph Street, Chicago, Ill.

Power PLOW Scraper

SHOTS FROM THE FIRING LINE — Continued

Frank Perry, one of the operators on this job, came in from Ariel recently, and the things he had to say about the 1¼-yard Diesel + Air were certainly highly enthusiastic. According to Frank they are only using 24 gallons of Diesel oil per 9-hour shift, and in three months of hard digging of rock and muck he only had to renew the hoist cable once. The machine, he claims, handles so easily that an operator can work a 9-hour shift and be ready to go to a dance immediately after supper. The operating cost, Frank says, shown by a two-months' run, including fuel oil, grease, repairs, kerosene, rags and all expenses except the services of the operators, showed a total charge of only 43 cents per hour. When one considers that Frank loaded 370 4-yard trucks in a 9-hour shift, with the temperature at 14 degrees below zero, one really appreciates what this economy means. As to grades, the machine will easily climb a 35 per cent grade, it being equipped with the same caterpillar-type mounting as its sister, the Gas + Air. Mr. Perry praises especially the governor, which protects the Diesel engine when the shovel is digging or running idle, and went over a list of many more mechanical advantages, which, says Frank, makes it the cheapest to operate and easiest to handle of any shovel he has run in his 18 years' experience.

California Notes

BY D. W. EVANS

Granfield, Farrar & Carlin have moved most of their shovel and truck equipment which has been busy on the Greenbrae job to the new job just north of San Rafael.

T. E. Connolly of San Francisco has made fine progress on his job on the Lincoln Highway near Emigrant gap. Sutsos and Chigris have finished their subcontract for Connolly and have moved their equipment out. G. D. Contoules has taken additional work from Connolly after completing his first sub. About half of this 400,000-yard job is finished.

Koppel Cars
give satisfactory results
Because of the experience of the builder and thought given to designs by its Engineers, which has resulted in placing strength and stability where most required, increasing the life of the equipment and reducing the minimum maintenance cost.
We invite comparison.
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KOPPEL INDUSTRIAL CAR AND EQUIPMENT CO.
KOPPEL, PA.
Chicago New York Pittsburgh

Owen Buckets
A MOUTHFUL AT EVERY BITE
"DIGGING FOOLS", THEY CALL THEM ON THE JOB!
And they are that too! Owen Buckets are built that way—it's the only way they *can* work. Dig down deep and come up with a full load every time. Can't help it! A bigger day's work than any other bucket of the same weight and capacity. Digging fools? Ask any Owen user. We'll send you a Folder that tells why with 17 reasons.
THE OWEN BUCKET CO.
6026 Breakwater Ave., Cleveland, Ohio

Boulder Dam

(Continued from Page 131.)

It required more than ten years of struggle before the Boulder Bill was approved on December 21, 1928. Work was done by Western representatives in Washington, which eventually overcame the opposition and made possible the future control of the Colorado. But after the passage of the bill there followed meetings of governors and representatives, and river commissioners, until finally all of the seven Western states affected by the proposed dam, save Arizona (the Colorado is the boundary between Nevada and Arizona at the place where Boulder Dam is to be built), ratified the measure as passed by Congress. When the six states of Colorado, Utah, Nevada, Wyoming, New Mexico and California placed their seals upon the agreement, the Boulder project became a future reality. The Colorado will be controlled, the barren lands will be peopled, alfalfa, fruit, grains, and products will grow where now lives only gila monsters, coyotes and sage brush.

Much Preliminary Work Still to Be Completed

This project estimated to cost $165,000,000 is a big task. Such big things require much paper and office work before the labor can actually start. So it is with this project. "It will take considerable time for field surveys and investigations, technical studies, preparation of designs and specifications and the issuance of advertisements, so that it will be several months and possibly longer before contracts can be let for construction of the dam," to quote from a document furnished by Chief Engineer R. F. Walter on February 5, 1930.

The office of the United States Department of the Interior, Bureau of Reclamation, at Denver, Colorado, has done much labor on the computations for the final design. This requires sorties into the kingdom of higher mathematics, for every pound pressure to be exerted by the water must be known and provided for. It is no easy simple adding machine task, this preparation. Not hardly, for the Colorado is a lively stream, it had to be for it dug the Grand Canyon.

The dam itself is but the beginning of the plan. The outer works, irrigation canals,* and power plants will in themselves stand out as gigantic in comparison to others. Not only in America, but in all the world is this true. There is no such other project.

No Sunday School Picnic — This Harnessing of the Colorado

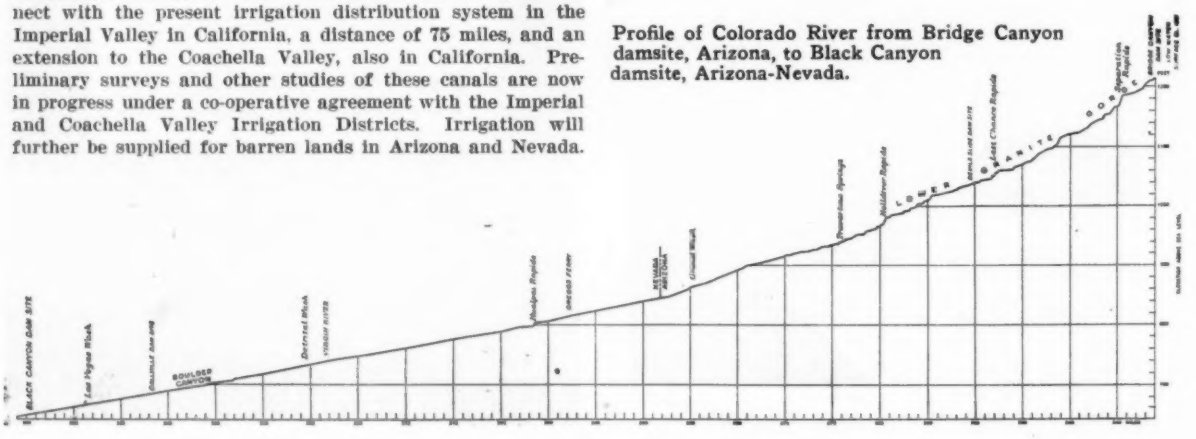
When one considers the might and strength of the Colorado River, instant recognition of the great task becomes clear. It will be no Sunday School picnic, no dress parade, to harness the Colorado. It is the greatest river in the entire Southwest flowing into the mighty Pacific.

The Colorado River drains an area of about 244,000 square miles. Every mile of this vast territory is fire-born from volcanos or ground into sand from ancient glaciers. It is a vast district of steep mountains, wide deserts, and fertile valleys. The five southern states cover some 282,910 square miles, or only 38,910 more square miles than the territory drained by the river Boulder Dam is destined to control.

The Colorado starts with its head high in the western air. The total fall from its source in the states of Colorado and Wyoming to its indolent silt-filled mouth in the Gulf of California is over 7,500 feet, or an average fall of about 4.5 feet per mile. The principal characteristics of its flow are low waters during the autumn and winter months, with a normal flood from the melting snows, usually beginning late in April, reaching its maximum in June and ending by the middle of August. This

*In addition to the dam, the project also contemplates construction of an all American Canal from Laguna Dam (an existing dam on the Colorado River about 9 miles northeast of Yuma, Arizona) or other suitable diversion dam, to connect with the present irrigation distribution system in the Imperial Valley in California, a distance of 75 miles, and an extension to the Coachella Valley, also in California. Preliminary surveys and other studies of these canals are now in progress under a co-operative agreement with the Imperial and Coachella Valley Irrigation Districts. Irrigation will further be supplied for barren lands in Arizona and Nevada.

Profile of Colorado River from Bridge Canyon damsite, Arizona, to Black Canyon damsite, Arizona-Nevada.



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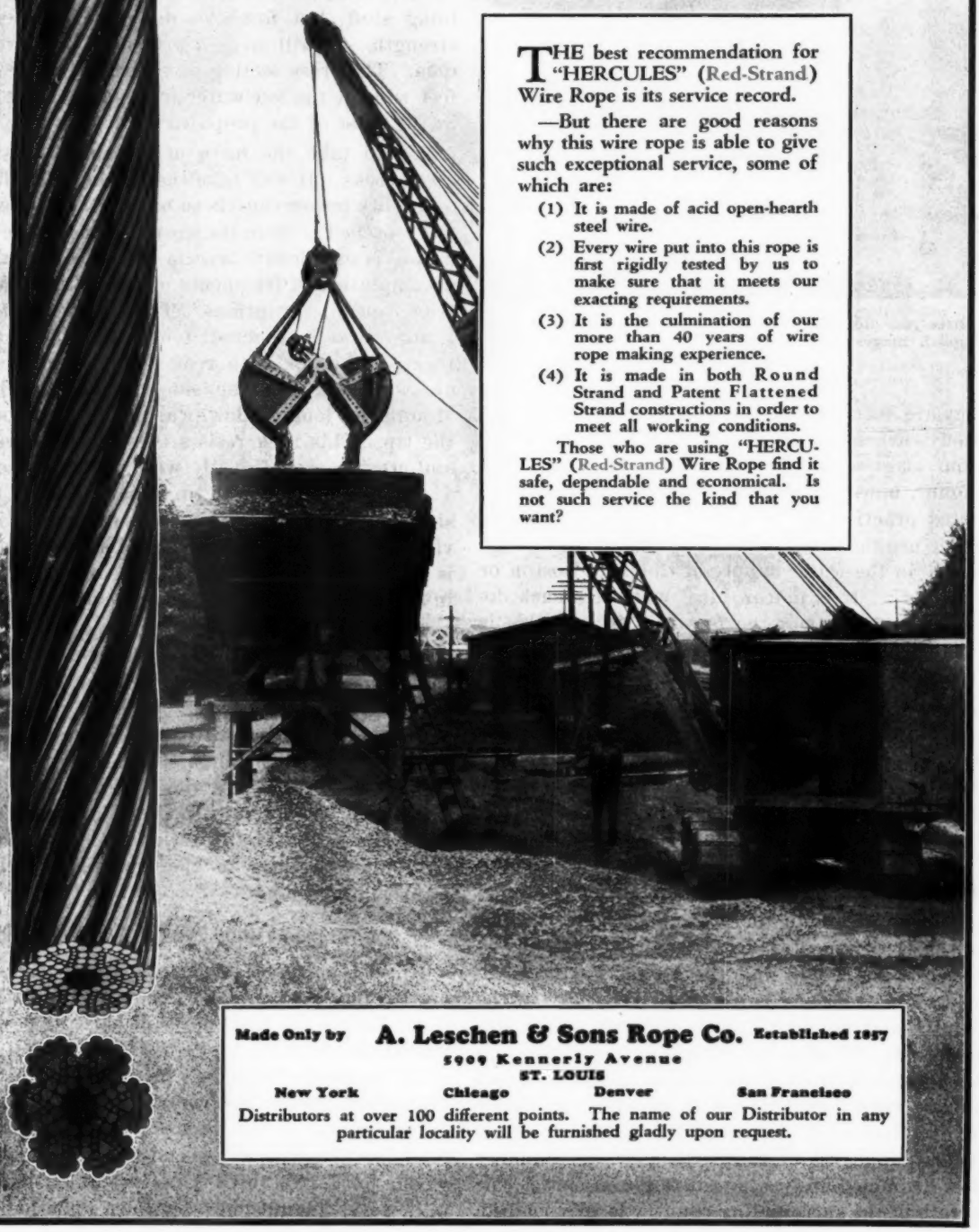
WIRE ROPE



THE best recommendation for "HERCULES" (Red-Strand) Wire Rope is its service record.

—But there are good reasons why this wire rope is able to give such exceptional service, some of which are:

(1) It is made of acid open-hearth steel wire.

(2) Every wire put into this rope is first rigidly tested by us to make sure that it meets our exacting requirements.

(3) It is the culmination of our more than 40 years of wire rope making experience.

(4) It is made in both Round Strand and Patent Flattened Strand constructions in order to meet all working conditions.

Those who are using "HERCULES" (Red-Strand) Wire Rope find it safe, dependable and economical. Is not such service the kind that you want?

Made Only by **A. Leschen & Sons Rope Co.** Established 1857

5909 Kennerly Avenue
ST. LOUIS

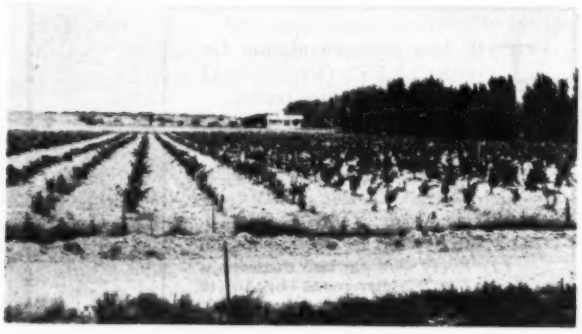
New York Chicago Denver San Francisco

Distributors at over 100 different points. The name of our Distributor in any particular locality will be furnished gladly upon request.

In writing to A. Leschen & Sons Rope Co. please use post card bound in the center of this number.

flow is modified and intensified by torrential floods of short duration, which come in general from its southern tributaries and may occur during almost any month of the spring, fall or winter. Its flood flows afford by far the greater quantity of water produced by the stream, and must be conserved and impounded in order to be successfully utilized for water supply and power production.

The Colorado is a rough, tough fellow, and consequently its waters take on its manner of living.



A three-year-old grape vineyard, once desert land. To accomplish magic such as this is one of the purposes of Boulder Dam.

They are normally high in dissolved mineral salts, chiefly carbonates, sulphates, and chlorides of calcium, magnesium, sodium, and potassium. The amount, however, is well within the limits of accepted practice for irrigation purposes. For domestic use the salt content is several times as high as it is in the water supply of Chicago, Boston or New York. It is not an ideal water for such domestic purposes, but the fact that it is usable is demonstrated by its use in the cities of the Imperial Valley, Needles, Yuma and in other communities along the lower river.

Boulder Dam when completed will be between 700 and 725 feet high above bed rock which is about 150 feet below the low water level of the river. If the Woolworth Building were set on bed rock with the bottom of the dam, the Woolworth tower would extend only a few yards above the top of the structure.

The site will be in Black Canyon about 30 miles southeast of Las Vegas, Nevada, a town of 3,500 present population, and the Union Pacific Railroad. The approach is comparatively easy to the vicinity and not particularly difficult to the site itself. But it takes leg muscle to get there, and there is much climbing to be done. A construction railway from Las Vegas will pass near available gravel, deposited there centuries ago by some ancient upheaval of the earth. The best quarry sites lie immediately adjacent to the dam site. The terrain of the surrounding country is very rugged. The depth of the black gorge is severe, but the land above the 1,500-foot contour is comparatively level. Here will be constructed the quarries, railway yards, shops and camps.

Where Canyon Walls Rise 900 Feet

The canyon walls at the dam site rise to about 900 feet above the swiftly flowing stream. The rock extends far down. The central part of the rock foundation is about 110 to 126 feet below low water. Good solid stuff this rock. No soft crumbling stuff, but fire-born donick of tremendous strength. It will make a firm foundation for the dam. The cross section of the black gorge is 350 feet wide at the low-water line, and 880 feet wide at the crest of the proposed dam.

It will take the force of dynamite to sunder these rocks. It will take the tearing steel fingers of mighty power shovels to move it after the blast has loosened it from its age-old home. The foundation is of volcanic breccia or tuff, originally an accumulation of fragments of many kinds derived from volcanic eruptions. Time has transformed it into a well-cemented, tough, durable, mass of rock. It stands with remarkably steep walls — almost sheer, like the side of the Washington Monument, looking downward as it expands from the tip. This rock resists the attack of weather and erosion exceptionally well. It will also offer a stubborn resistance to dynamite and power shovels. The whole rock mass is essentially impervious. It is almost ideal rock for tunneling. It is satisfactory to the engineers in every detail, and in addition is suitable for use in construction.

The supreme head of this task, of course, is the Congress of the United States. The other heads are President Hoover, Secretary Wilbur, and the two men who will do the actual overseeing of the work, and upon whom actually rests the responsibility, are Dr. Elwood Mead, and R. F. Walter. The former is the United States Commissioner of Reclamation, a man long proven in America and Australia in matters of irrigation. The latter is the Chief Engineer of the government office at Denver, Colorado.

Town for Some 4000 People Planned on Site

It is a remarkable undertaking and of great import to the West, and, therefore, to the entire nation. Before the first charge of blasting powder is exploded, before the first whistle of the first power shovel weakens the echoes in these dead hills, the contractors or the government must build a town to accommodate the thousands of workers and their families who will spend seven or eight years on the job. This town is not yet in existence. It is, however, planned and set down upon paper. It

Questions and Answers About ERIE BUCKETS

SPECIAL DIGGER

For Severe Excavating

SCRAPER

For Rehandling and Clean-up Work

How Do Erie Buckets Reduce Material Handling Costs?

Erie Buckets reduce material handling costs by making extra trips per day and carrying more material per trip. Actual tests have proven this.

MULTI-POWER

The Low Head Room Bucket

Why Do Erie Buckets Carry More Material per Trip?

Because they are designed correctly. The scoops are shaped so that they counteract the lifting tendency of the Bucket while closing. The material is lifted up into the Bucket with the least amount of resistance possible by the cutting lips. This material in turn, adds weight to the Bucket, assisting in holding it down in the material, thereby obtaining a larger load.

HEAVY DUTY

The Ideal Steel Mill Bucket

There is a reason—Yes, seven of them! —why you should give this Bucket your consideration:

1. By combining the Multiple rope and Lever Arm principles we obtain a better digger and a faster Bucket.
2. It can be rigged up with from 2 to 6 parts of line, and due to its design and height is faster with 6 parts of line than other Buckets with 4 and 5.
3. It's the lowest headroom Bucket built. This makes it especially adapted for cranes with short booms.
4. 13-inch diameter sheaves insure longer life of the cable.
5. Counterweights can be added by one man in 100 pound increments up to 600 pounds, to suit the type of material to be dug.
6. Improved stops, reinforced power arm, solid head and heavy banded scoops make this Bucket strong and sturdy to hold up under severe service.
7. This Bucket is guaranteed to dig as well or better than any Bucket of equal weight and parts of line. Any part found defective due to material and workmanship within one year will be replaced free of charge.

PEERLESS

The General Purpose Bucket

A Bucket catalogue containing complete specifications will be gladly sent upon request.

Prices can be secured by return mail if you will give the type and size of Bucket in which you are interested.

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will not be started until appropriations are made available by Congress for the construction of Boulder Dam. These in turn depend on the securing of contracts for the sale of power sufficient to repay the cost of the dam.

Construction of Boulder Dam is under the direction of the government, but it need not be a government job. It may be built by private companies. The construction of the dam will be advertised. If reasonable bids are received from responsible companies, the dam will be built by contract. If it is done by contract labor, the machinery used, average number of employed men and classification of workers will depend on the organization and plans of the contractor.

Irrigable Government Land Not Available Till Reclamation Is a Fact

The wildcat salesman is abroad in the Western land. He is offering so-called irrigable land for sale at bargain prices. But of a truth there is no such land available. All public lands in the immediate vicinity of the dam site have been withdrawn from entry for construction purposes. It will be needed for shops, towns, storage, etc. And, get this, all public lands which will be irrigated under the Boulder project have been withdrawn from entry and will not be available for settlement until the dam is completed and water can be furnished for irrigation purposes. In other words, the men employed by our good old Uncle Sam do not intend to let a man die of thirst and starvation, on the desert, no matter how many colors are used in the real estate folders.

The lands when restored are to be subject to entry under the reclamation law, and preference right-of-entry is to be given to ex-service men. And an ex-service man cannot be too careful where he selects to build his home, but if he gets lands with available water they are extremely productive, provided they are properly worked.

The melancholy cries of the lonesome coyote sweep over the lands near the black gorge. The buzzard floats in the sky above, the hop toad and scorpion lurk beneath the sage, for this is a strenuous land. A land of magnificent distances, but iron-bound by the laws of a heat-born terrain. Indeed there are no irrigable lands in the immediate vicinity of the dam, such lands as are susceptible of irrigation under this project being mainly in the vicinity of Parker, Arizona, in the areas tributary to the Yuma project in the same state, the Palo Verde or Blythe project of California, and lands in the Imperial and Coachella Valleys of the Golden State. Here water and much work will cause gardens to grow where now the wind whistles through the greasewood and tumble weeds.

It is too early to outline the policy that may be adopted in the matter of concessions at the dam site. If the work is done on contract, the general contractor usually supervises, and operates the major concessions. This is especially true of those located in the construction camp, such as commissary dormitories, mess houses, hospitals, and the like. On the Boulder Dam project, however, a suitable area may be set aside for concessions, under government control, and by competitive bids.

It will require hardy men to build Boulder Dam. And to give as clear an idea as print will give, here is the official record average of the temperature at the dam site. It's a tough one. It varies from a minimum of 20 degrees F. below good old zero, to a maximum of 120 degrees F. above zero, and that is almost hot enough to fry an egg on the slab side of a boulder.

Aim for a Tree!

"Oh, John," screamed the excited woman driver, "the car is running away."

"Can't you stop it?" asked her worried husband.

"No."

"Well, then, see if you can't hit something cheap."

HUG

ROADBUILDER

Heavy Loads With Efficiency

MODEL 97-6

BUILT to haul heavy loads, Model 97-6 is adapted for dirt moving, gravel hauling, material yard delivery and coal hauling up to a maximum load capacity of 18,000 pounds. The specially designed auxiliary rear axle permits the hauling of heavy loads over highways without conflicting with the weight limits of the various states.

Model 97-6 equipped with a 7 speed forward 2 speed reverse Amidship Type Transmission, and a Buda Heavy Duty Six Cylinder Truck Engine will deliver heavy loads over unmade roads or on the paved highway with the same efficiency as smaller units.

THE HUG CO., Highland, Illinois

In writing to The Hug Co. please use post card bound in the center of this number.

Damming the Sacandaga

(Continued from Page 125.)

W. J. Pratt, operator, sends us this snapshot of the 50-B Diesel he handled. It's a bit wet under foot, but the 50-B doesn't seem to mind.

within a few feet of the sides was blasted loose first and the sides trimmed with delay exploders or with follow-up holes drilled along the sides of the channel. With the exception of the "coyote" holes which were loaded with black powder, 50 per cent dynamite was used.

Diverting the River

The flow of the river was diverted from its natural channel into the new channel at a time when the river had a discharge of 3,500 cubic feet per second. This was accomplished by building a rock fill across the old channel at the upstream toe of the dam. Loose rock was dumped from trucks on both sides of the river until the channel was narrowed into a width of about thirty feet. The velocity of the water was then swift enough to wash away boulders larger than one cubic yard when they were dumped into the gap. A timber crib was floated into the gap and filled with loose rock. The flow through the large openings in the rock fill was checked by dumping smaller rock along the upstream face, and the seepage through the fill further reduced with a covering of fine material.

After the river diversion had been effected, the foundation for the earth fill was prepared by excavating from the site all layers of boulders and other objectionable material. This included a four-foot layer of boulders in the old river channel area. A cutoff trench with a 20-foot depth and 50-foot bottom width was excavated along the axis of the dam. The stripping of boulders, etc., and the top eight or ten feet of the cutoff trench were made with two Bucyrus-Erie 50-B shovels, and the Bucyrus-Erie driven by a Diesel engine was later converted into a dragline excavator for taking out the bottom lift of the cutoff trench. A large part of this 45,000 cubic yards of under dam excavation was hauled out to dumps at the toes of the dam with the same narrow gauge equipment used in the rock excavation work. The boulders went into the downstream toe, and the finer materials were taken to the upstream side. Eight per cent grades were required to elevate the material to the top of the dumps. Two 4-yard car trains were used at the start, and then increased to four cars when it was found the 20-ton Plymouths could easily make the grades with that load.

The material excavated with the dragline was piled along the sides of the cutoff trench and loaded from the piles on to the cars with a Bucyrus-Erie B-2 shovel. This expedited progress and allowed some of the water to drain out of the material.

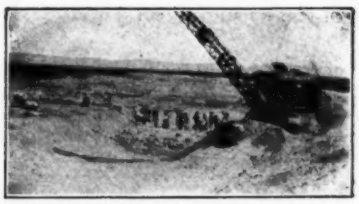
Building the 660,000-yard Earth Fill

The main part of the 660,000-cubic-yard earth fill was built by dumping material from trains on the inside of dikes at the upstream and downstream sides of the dam, where it was sluiced with strong jets of water. This sluicing operation, in addition to thoroughly compacting all ma-

(Continued on Page 163.)

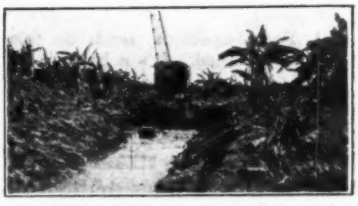
Three steps: left, beginning excavations for foundations of earth-fill embankment; center, excavating cut-off trench under earth-fill embankment; right, building the hydraulic fill.

You'll have to match these new standards..... *to keep up-*



IN MEXICO—A Bucyrus-Erie, powered with an Atlas Imperial Diesel, on a government irrigation project.

IN BURMA — A Bucyrus-Erie, powered with an Atlas Imperial Diesel, on an irrigation project.



IN SOUTH AMERICA — A Bucyrus-Erie, powered with an Atlas Imperial Diesel, on a drainage project.

COOLIDGE DAM — A Bucyrus-Erie, powered with an Atlas Imperial Diesel, in use on this famous project.

BECAUSE it turns out 10% to 15% more yardage . . and costs 75% to 90% less for fuel . . new dirt-moving standards are being set, throughout the world . . by the excavator powered with an Atlas Imperial Diesel Engine.

It consumes ½ to ⅓ as much fuel as a gasoline engine . . and it burns only cheap, low-grade fuel oil, which costs ⅓ to ¼ as much.

In a pinch . . it never falters. Under heavy load, where a gasoline engine normally stalls, the Atlas Imperial Diesel digs-in and lugs. Because, uniquely, its lugging power (torque) increases under such conditions.

Anywhere . . under the most severe conditions, the Atlas Imperial Diesel stands the gaff. Day-in and day-out . . from shift to shift . . it stays right on the job.

No water troubles . . no boiler tending.

From stone cold . . it starts in ten seconds. No troublesome ignition system. No spark plugs.

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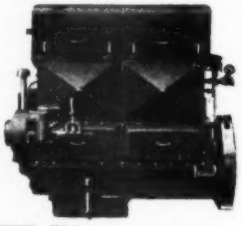

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Damming the Sacandaga

(Continued from Page 161.)

terials, separated the fine particles from the material, and carried them with the flowing water to a segregation pool along the axis of the dam where they were deposited to form an impermeable core in the center of the embankment. The coarser material was left behind to give the structure stability, and the sand was checked at the edges of the pool, so that the final structure had the finest particles in the center and a gradation with the sizes of material gradually increasing toward the outside until boulders and gravel are the principal formation in the outer slopes.

Convenient Borrow Pits Opened at South End of the Dam

Suitable material for this fill was conveniently found in the hillside borrow pits at the south end of the dam. A pit on the upstream side furnished

Three-fourth-yard steamers carved out the channel cut 20 feet wide — 50 feet deep!

material for the upstream dike, and for the downstream dike there was a pit on the downstream side. The average haul was about 1,500 feet.

The material in the pit is very compact, with the boulders and pebbles tightly embedded into the

(Continued on Page 164.)

When the *only* rope breaks—

where do we go from here?

ALWAYS have an extra rope on hand — it's low-cost insurance against delays.

And order your next wire rope from Bucyrus-Erie. Wire rope efficiency is not only dependent upon proper care but upon proper selection.

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BUCYRUS-ERIE COMPANY

SPECIALTY DEPARTMENT

South Milwaukee, Wisconsin

BUCYRUS ERIE

Damming the Sacandaga

(Continued from Page 163.)

finer particles. A newly excavated bank in this material will stand vertical for several weeks. The material was loosened for excavating by blasting with 15 per cent dynamite placed in well drill and "gopher" holes. The well drill gave the better results. The holes were in a row, with a distance from the excavated face equal to the depth of hole, and the holes spaced in the row from two-thirds to three-fourths the depth. On account of the limited borrow area and the rough topography of the original surface of the ground, it was desirable to make the cuts as deep as possible. The high side of some cuts reached 50 feet or more.

This part of the work was begun on July 16, 1929, with one Bucyrus-Erie 50-B steam shovel in a pit, and, on July 22nd, the 50-B Diesel, which had been converted back to a shovel, was taken to the borrow pit. A new Bucyrus-Erie 50-B steam shovel was added to these on September 17th. In addition to the three 50-B's, two ¾-yard shovels, one a Bucyrus-Erie and one an Osgood, made all the pilot cuts and roadbeds for new lifts. Whenever possible the material excavated by these small shovels was loaded to trucks and taken to the embankment. About 40,000 cubic yards were delivered by these trucks in four months.

The side slopes of the earth fill vary from one vertical on 2½ horizontal to one vertical on 4¼ horizontal. As the dam grew the dump tracks were advanced along the approximate slopes by jacking in lifts about one foot in elevation and throwing the equivalent horizontal distance. The crew on the upstream dump used only ordinary track jack and lining tools. The other crew had the assistance of a Nordberg track shifter.

"Fill 'em up" were the orders, and filled up they were when the Plymouths dragged them out from the borrow for the hydraulic fill material. Well drills had the best of it over gopher holes in drilling this hardpan.

Sluicing Caves Material on Dumps

A Western spreader was provided but not used, since the sluicing forces, with the help of a small amount of hand labor from the dump crews, were able to keep the material caved away from the tracks to provide dumping space at all times.

Operations were suspended by November 24th by winter weather conditions, just as the work reached the point where the sluicing was no longer required. The three 50-B shovels worked twelve ten-hour shifts per week, and made the following weekly averages during the period engaged in borrow pit excavation for the hydraulic fill:

The old Bucyrus-Erie 50-B steam shovel averaged 10,400 cubic yards per week.

The Bucyrus-Erie 50-B Diesel averaged 11,250 cubic yards per week.

The new Bucyrus-Erie 50-B shovel averaged 13,400 cubic yards per week.

The dam will be topped out as soon as weather conditions permit, and a highway built along the top.

For S. J. Groves & Son, General Superintendent Lease is in charge, assisted by Superintendent Cox.

"So you were in the hospital three months! Must have been pretty sick!"

"No, pretty nurse."

MAN WANTED The user of a Hayward Bucket needs only one man to sit in the cab of the crane and operate the bucket. Address The Hayward Company, 52-54 Church St., New York, N. Y.
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